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GENDRON (Y.). **Action du lait de Coco et d'un extrait de coprah sur la multiplication du virus de la mosaïque du Tabac et du virus X de la Pomme de terre chez le Tabac.** [Action of Coco-nut milk and of a copra extract on the multiplication of the Tobacco mosaic virus and of Potato virus X in Tobacco.]—*C. R. Acad. Sci., Paris*, 230, 22, pp. 1974–1975, 1950.

Details are given of experiments demonstrating the existence in coco-nut milk and copra extract of a substance capable of inhibiting the multiplication of the tobacco mosaic virus and of potato virus X in Samsun tobacco leaves, and of diminishing the susceptibility to the former of the hypersensitive *Datura stramonium* and *Nicotiana glutinosa*. The substance acts on the host and not on the virus, the infectivity of which (in a test on tobacco mosaic) was not reduced.

UTECH (NEDRA M.) & JOHNSON (J.). **The inactivation of plant viruses by substances obtained from bacteria and fungi.**—*Phytopathology*, 40, 3, pp. 247–265, 1950.

In studies made at the University of Wisconsin, substances obtained as growth products from cultures of filamentous fungi and bacteria, expressed juice of fleshy fungi, or water extracts from herbarium specimens of Basidiomycetes were tested for their ability to inactivate tobacco mosaic virus [*R.A.M.*, 23, p. 55] as measured by the local lesion response on the hybrid of *Nicotiana tabacum* and *N. glutinosa*.

All the Basidiomycetes used inactivated the virus to a marked degree. *Boletinus pictus*, *Amanita phalloides*, and *Pleurotus ostreatus* gave more than 90 per cent. inactivation at a 0·5 per cent. concentration of the inactivator. *Morchella*, the only fleshy Ascomycete used, gave 99 per cent. inactivation at a 4 per cent. concentration. Growth products from *Rhodotorula* sp. and *Penicillium spiculosporum* were also good inactivators. Most of the Phycomycetes gave over 90 per cent. inactivation at a 50 per cent. concentration of inactivator.

Generally speaking, temperatures most favourable for growth were most favourable for the production of inactivators. With most cultures the inactivator concentration reached a maximum after rapid growth had ceased and remained at a high level for some time.

Growth products of *Pseudomonas aeruginosa*, *Rhodotorula* sp., and two preparations of *Coprinus micaceus* juice were tested comparatively for their ability to inactivate tobacco mosaic, tobacco ring spot, tobacco streak, potato ring spot, cucumber mosaic, and cabbage mosaic viruses. Untreated juice of *C. micaceus* and the growth product of *P. aeruginosa* gave a relatively uniform and good inactivation of all six viruses at the concentrations tested. *Coprinus* juice, concentrated to $\frac{1}{10}$ of its volume by evaporation at 100° C. and diluted to the original concentration prior to testing, reduced the activity of tobacco mosaic virus to the same degree as untreated juice.

In an attempt to separate and partially purify some of the better inactivators, that from the growth product of *Bacterium* [*Xanthomonas*] *stewarti* was precipitated

without loss of activity by N/20 hydrochloric acid at pH 4·5. Although they remained stable to short heat treatments at 100°, the growth products of *X. stewarti* and *Aerobacter aerogenes* lost their inactivating power when such treatments were prolonged. The inactivator of *Coprinus micaceus*, however, was stable to prolonged heating. All three inactivators lost some activity when evaporated to dryness.

Since some inactivators are readily obtainable in relatively large quantities and are easily maintained, they offer interesting possibilities for further studies on the nature of inactivation, separation of virus mixtures, and possible use in the control of plant and animal virus diseases.

MARCELLI (E.). **Carattere endemico dei 'tumori radicali' presumibilmente da Bact. tumefaciens in campi di Tabacco. (Nota preliminare.)** [Endemic character of 'root tumours' presumably due to *Bacterium tumefaciens* in fields of Tobacco. (Preliminary note.)]—*Notiz. Malatt. Piante, 1950*, 9, pp. 58–60, 1950. [Mimeographed.]

In 1949 Kentucky tobacco growing at Rieti, Italy, developed tumours on the collar and secondary roots resembling those caused by *Bacterium tumefaciens* [*R.A.M.*, 26, p. 34]. Inoculations of stems and leaves of *Nicotiana glauca* with a bacterium isolated from affected material gave rise to numerous swellings, while inoculations of the collar of Virginia Bright and Burley Giuseppina seedlings gave tumours up to 6 cm. in diameter, together with small ones on the secondary roots. The tumours produced on *N. glauca* by the author's strain and by a known strain of *Bact. tumefaciens* showed no morphological differences, though the author's strain was the more virulent of the two, producing swellings even in the capillary veins of the young leaves.

When Virginia Bright seedlings inoculated in the collar with the author's strain were grown in soil to which ferrous sulphate was added at the rate of 5 ql. per ha. [1 ql. = 100 kg.] no tumours developed, though seven of ten seedlings grown in untreated soil developed very large tumours [ibid., 26, p. 237].

SCARAMUZZI (G.). **Chiarimenti intorno al 'seccume concentrico' delle foglie di Tabacco.** [Elucidatory notes on 'concentric wilt' of Tobacco leaves.]—*Notiz. Malatt. Piante, 1950*, 8, pp. 45–53, 1950. [Mimeographed.]

In amplification of his earlier paper on 'concentric wilt' of tobacco in Italy [*R.A.M.*, 29, pp. 60, 387] the author compares the symptoms caused in tobacco by *Bacterium* [*Pseudomonas*] *tabacum* and *Bact.* [*P.*] *angulata* as described in the literature. He concludes that the Italian disease is due to *P. tabacum*, though the symptoms are not those normally caused by either organism, but those of 'black-fire' [loc. cit.]. The condition would appear to have been present in Italy for some time.

BALDACCI (E.), CIFERRI (R.), ORSENIGO (M.), & SCARAMUZZI (G.). **Osservazioni sul 'cancro batterico' del Pioppo in Lombardia.** [Observations on 'bacterial canker' of Poplar in Lombardy.]—*Notiz. Malatt. Piante, 1950*, 9, pp. 15–25, 1 pl., 1950. [Mimeographed.]

In the spring of 1949 diseased poplar shoots and seedlings from a nursery near Pavia and from adult trees grown at Voghera and Ponte Nizza from shoots received from the Pavia nursery developed pathological features of three kinds, namely (i) the collar of one-year-old trees was completely dead, with vertical cracks in the cortical tissue extending to the wood, (ii) the cortical tissues, sometimes of the whole shoot, had turned black, and (iii) irregular swellings formed along the stems of seedlings one or two years old. From infected material a bacterium (not yet identified) forming white or yellowish-white colonies, was isolated and inoculations with it into poplar seedlings gave rise to swellings in the young

branches. The disease is thought to be due, probably, to several different strains of bacteria [cf. *R.A.M.*, 28, p. 315].

Ciferri (R.). **La 'mummificazione' delle Castagne da Phomopsis endogena (Speg.) nobis, n.comb.** [Mummification of Chestnuts by *Phomopsis endogena* (Speg.) nobis, n.comb.]—*Notiz. Malatt. Piante, 1950*, 8, pp. 36–37, 1950. [Mimeographed.]

In 1947 mummified chestnuts in the province of Cuneo, Italy, were permeated by a fungus agreeing with the descriptions of *Phoma endogena* [*R.A.M.*, 25, p. 539]. The author's fungus, however, showed all the characters of a *Phomopsis*, including filiform pycnidiospores, and a new combination, *P. endogena*, is made. *P. viterbensis* [ibid., 28, p. 315; 29, p. 64] would appear to be identical with *P. endogena*. If this is confirmed, Latium would seem to be the southern limit of the geographical distribution of the fungus, which is present also in Piedmont, Veneto, and France.

Thomsen (M.), Buchwald (N. F.), & Hauberg (P. A.). **Angreb af Cryptococcus fagi, Nectria galligena og andre parasiter paa Bøg i Danmark 1939–43.** [Attack of *Cryptococcus fagi*, *Nectria galligena*, and other parasites on Beech in Denmark 1939 to 1943.]—*Forstl. Forsøgsv. Danm.*, 18, 2, pp. 97–326, 33 pl. (1 col.), 1 fig., 1 diag., 3 graphs, 3 maps, 1949. [English summary.]

This is an exhaustive, fully tabulated survey, supplemented by a four-page bibliography, of investigations in Denmark from 1939 to 1943 on the depredations (which began to assume a severe form in the thirties of the present century) of the beech scale, *Cryptococcus fagi*, and its associated fungal and insect parasites. Most important among the former is *Nectria galligena* [*R.A.M.*, 3, p. 430; 13, p. 732], first observed in the company of the insect in 1941. On one of the experimental plots over half the trees were attacked, the conidial pustules appearing in June or July and the perithecia in the autumn. The latter organs were often so abundant that the entire trunk acquired a noticeable red tinge. In the following year the bark of severely infected trunks peeled off, greatly weakening and in some cases killing the trees. *N. cinnabarina* [loc. cit.] was also observed from 1941 to 1943, but on a less extensive scale than the foregoing species.

Lignicolous fungi further contributed materially to the mortality of the trees, causing bark and wood decay, often accompanied by breakage. *Stereum hirsutum* [ibid., 12, p. 664] was the most prevalent, followed by *Polyporus adustus* [ibid., 25, p. 36], which were found on 21 and 14 trees, respectively, in the test plot referred to above. The destruction of the sapwood was succeeded by the appearance of species attacking the heartwood, foremost among which were *Fomes fomentarius* [ibid., 15, p. 473; 21, p. 475] and *F. ungulatus*, while others included *P. radiatus*, *Corticium leve* [ibid., 14, pp. 68, 270], and *Armillaria mucida*.

Ehrlich's studies on the beech bark disease in the United States [ibid., 13, p. 732] have shown that the sucking organs of the coccids penetrate the bark and reach the phelloderm, or in some cases even the phloem. Young trees react by an abnormal growth of the parenchyma, resulting in a local swelling and eventual rupture of the bark, while the parenchyma itself and the underlying wood turn brown. Callus is formed along the cortical fissures (Hartig: *Unters. forstbot. Inst.*, 1, 1880). Only a few such cases were observed by the authors, most of the trees in the experimental areas being upwards of 80 years old and exhibiting a somewhat different response. In the presence of numerous coccids a brown area of necrotic cells develops in the bark; partial desiccation ensues and fine cracks are formed on the outer surface, through which the tree is invaded by saprophytic and parasitic organisms. The former are able to grow on the dead tissues, in which a yellowish or brownish fluid collects, loosening the bark from the wood. In the final stages it exudes through the dead bark and trickles down the surface, forming a 'slime flux' or 'brown spot'

ranging in size from 1 to 10 sq. cm. On the infested areas 'boils' may develop and subsequently burst, so that deeper fissures are formed. When the slime flux spots occur in large numbers on the surface, the affected portion dies and becomes surrounded by callus from the bark, the necrotic area often being spindle-shaped and sunken. Such sites frequently serve as portals of ingress for *Nectria* and other fungi. Another symptom of the disease is the sparse foliation of the crown.

Mild cases of the beech bark disease may be arrested by excision of the infested areas before the entrance of the secondary fungal invaders. No definite conclusions could be drawn from the spraying experiments on 300 trees in 1940 with a 3 per cent. dilution of a commercial miscible oil, but it seems likely that adequate control could be achieved along these lines at a reasonable expenditure, having regard to the heavy losses resulting both directly and indirectly from the disease.

Scheffer (T. C.) & Hopp (H.). **Decay resistance of Black Locust heartwood.**—*Tech. Bull. U.S. Dep. Agric.* 984, 37 pp., 2 figs., 11 graphs, 1949.

When dried blocks ($\frac{1}{2}$ by 2 by $\frac{1}{4}$ in.) of heartwood from the yellow shipmast locust (*Robinia pseudo-acacia*) [var. *rectissima*], an undescribed variety Flowerfield, and several of the common seed-reproduced black locust, all from Long Island, New York, were exposed to infection by pure cultures of *Fomes rimosus* and *Poria incrassata* [*R.A.M.*, 18, p. 284; 28, p. 148] for four months at 80° F. and 80 per cent. humidity in bottles on malt agar the Flowerfield strain decayed least on the average, the shipmast rather more, and the common locust much more. Radially resistance was progressively less towards the centre. Vertically the outer heartwood was progressively less resistant from the base upwards, the opposite trend occurring in the inner heartwood. In the tree as a whole the basal outer heartwood was the most resistant and the inner the least. Large trees were more resistant in the outer heartwood than small ones, but for the inner heartwood the reverse obtained; large trees were superior to small ones in the average resistance of the entire heartwood cross section. With trees of equal diameter those which grew slowly were slightly more resistant than others. The closer the sample was to the sapwood and the more numerous the annual rings between it and the pith, the greater was the resistance. Wood with more rings per inch or of lower specific gravity was more resistant than other wood, and yellow wood more resistant than brown. Resistance was partly associated with substances which could be extracted with hot water [ibid., 23, p. 418], and were toxic to the fungi.

Davidson (R. W.). **A western White Pine twig canker.**—*Plant Dis. Reptr*, 34, 4, p. 99, 1950. [Multilithed.]

In August, 1949, *Cucurbidothis* [*Cucurbitaria*] *pithyophila* [*R.A.M.*, 26, p. 267] was found fruiting on numerous cankers on small twigs in the lower crown of a pole-sized *Pinus monticola* tree near Nakusp, British Columbia. Previous collections made in Idaho (1917) and Washington (1942) indicate that the pathogen may be widespread in the western white pine area. No information is available regarding its prevalence or pathological importance.

Kamei (S.) & Hoshi (S.). **On the brown root and butt rot of conifers in the National Forest of Akan, Hokkaido.**—*Res. Bull. exp. For. Hokkaido Univ.*, 14, 1, pp. 144–176, 5 pl., 1948. [Abs. in *For. Abstr.*, 11, 2, p. 259, 1949.]

Fomes annosus caused considerable damage to *Abies* [*sachalinensis* var.] *mayriana* and *Picea glehnii* in the National Forest of Akan, Hokkaido, Japan. Most of the affected trees were over-mature, but some young ones were also attacked. In two sample plots about 50 per cent. of the firs and 20 per cent. of the spruce trees showed infection, the average volume rotted being 29·1 per cent. for fir and 34·2 per cent. for spruce. The optimum and maximum temperatures for mycelial

growth were 22° to 23° and 26° to 27° C., respectively; at 50° the fungus died in about five minutes.

The decay resistance of some 16 Hokkaido species was tested. Of the hardwoods, *Ostrya japonica*, *Magnolia obovata*, *Cercidiphyllum japonicum*, *Fagus crenata*, and *Quercus crispula* were the most, and *Tilia japonica* the least resistant. Of the three indigenous conifers, *A. sachalinensis* var. *mayriana* was the most durable, followed by *P. jezoensis* and *P. glehnii*.

VARNER (R. W.). **The Rennerfelt method for determining the occurrence of decay and its application to Michigan forests.**—*Pap. Mich. Acad. Sci.*, 34, (*1948*), Part I, pp. 79–82, 1 pl., 1950.

The Rennerfelt method for determining decay [*R.A.M.*, 25, p. 374] was applied in two jack pine (*Pinus banksiana*) stands on the Lower Michigan National Forest near East Tawas. The average age of the trees in area A was 30 years. The quality of the site of area B was classified as poor; the trees were approximately 50 years old. There was no external evidence of fungus activity on either site. Cores were taken from sample trees at six inches and five feet from the ground, all borings extending well beyond the centre of the tree. After four weeks' incubation all the fungi isolated were determined as *Fomes pini*. All trees yielding the fungus exhibited a red stain. Ten per cent. of the trees in area A were infected and 40 per cent. of those in B. In each area the percentage of infected trees was the same for those with visible wounds as for those without. The accuracy of the results obtained by this method was checked by felling the trees sampled.

BAXTER (D. V.). **Some resupinate Polypores from the region of the Great Lakes. XX.**—*Pap. Mich. Acad. Sci.*, 34, (*1948*), Part I, pp. 41–56, 6 pl., 1950.

In this contribution to the present series of studies [cf. *R.A.M.*, 28, p. 596] full accounts are given of six polypores, including *Poria atrorubens* n.sp. on *Liquidambar styraciflua* and *P. megalopora*, which causes a white, stringy rot of oak and *Carya* sp.

NEVARD (E. H.). **Timber preservation.**—*J.R. Inst. Brit. Archit.*, Ser. 3, 56, 4, pp. 170–171, 1949.

The essential information on timber preservation is summarized, following a brief historical introduction, under the headings of development of preservatives, methods of application, growth of fungi, modern preservatives, and need for preservation.

JAPING (H. W.). **Houtverduurzaming.** [Wood preservation.]—*Tectona*, 39, 4, pp. 313–328, 1949.

Following (I) a brief introduction, the essential information on wood preservation is presented under the headings of (II) causes of damage to wood, (III) principles of wood preservation, (IV) preservatives, (V) the various types of preservatives, (VI) preparation of the wood for treatment, (VII) methods of application of wood impregnation, (VIII) factors affecting the penetration of preservatives into the wood, and (IX) permeability of wood for preservatives, concluding with a table of native Indonesian woods arranged in three categories (permeable with difficulty, moderately easily, and easily).

BORGES (MARIA DE L. V.). **O virus do mosaico amarelo do Nabo.** [The yellow mosaic virus of the Turnip.]—*Agron. lusit.*, 9, 4, pp. 253–264, 3 pl., 1947. [English summary. Received May, 1950.]

In February, 1946, some of the plants in a turnip field in a Lisbon park presented highly conspicuous symptoms of a virus disease. The youngest leaves showed a

reticulate chlorosis of the veins, the middle ones mosaic, and the oldest quasi-complete chlorosis of the lamina, with a few green islands. In January, 1947, turnips left behind in a field at Cintra presented an aspect identical with the foregoing. Infection was transmitted from diseased to healthy turnips by mechanical inoculation, using carborundum as an abrasive, after an incubation period of eight to ten days. Other plants contracting the disease in the same way (aphid transmission tests gave negative results) included Chinese cabbage, mustard, *Eruca sativa*, *Iberis umbellata*, *Isatis tinctoria*, *Lepidium sativum*, *Malcomia maritima*, *Nasturtium officinale*, radish, *Raphanus raphanistrum*, and *Sisymbrium officinale*. The predominant symptoms were chlorosis of the veins and mosaic. In these experimental hosts the incubation period of the virus was also brief, with a minimum of seven days in Chinese cabbage.

At a dilution of 1 in 200,000 the virus was still infective after 22 days. It withstood nine days' ageing *in vitro* and ten minutes' exposure to a temperature of 60° C. Using the method applied by Markham and Smith for the isolation of their turnip yellow mosaic virus [*R.A.M.*, 25, p. 284], the Lisbon virus was obtained in the form of octahedric crystals. From a comparative study of the latter and a number of other crucifer viruses it seems clear that the Lisbon yellow mosaic virus of turnips is identical with that of Markham and Smith [ibid., 28, p. 261].

Ciferri (R.). **Elenco delle malattie e dei parassiti della Barbabietola sino ad oggi segnalati in Italia.** [List of the diseases and parasites of Beet so far reported in Italy.]—*Notiz. Malatt. Piante, 1950*, 8, pp. 18–27, 1950. [Mimeographed.]

This list of the fungal, bacterial, virus, and physiological diseases of beet in Italy gives notes on their causes, symptoms, development, geographical distribution, injuriousness, and control. Mention may be made of the following. *Urophlyctis leproides* [*R.A.M.*, 14, pp. 429, 548], causing tumours at the collar, with small, dense, misshapen, discoloured leaves, which often drop off, occurs occasionally, but seldom causes serious loss. Foot rot is associated with *Pythium debaryanum* [cf. ibid., 23, p. 465; 28, p. 263], but *P. gracile* [ibid., 9, p. 175; 10, p. 591] also is probably present. Seedling and young beets also suffer from foot rot due to *Pleospora betae* [ibid., 25, p. 198], while reports have also been received of infection by *Corticium vagum* var. *solani* [*C. solani*: ibid., 22, p. 372; 28, pp. 150, 264] and *Helicobasidium purpureum* [cf. ibid., 27, p. 351; 28, p. 620].

'Red sclerotial disease' (*Typhula brassicae*) [ibid., 8, p. 597; 25, p. 217] has been reported from Piedmont to Latium, causing damage locally. Injury is sometimes serious. The fungus appears to be more common on forage than on sugar beets. 'Brown sclerotial disease' (*Sclerotium rolfsii*) [ibid., 25, p. 493] has been reported once, but is not known to cause any loss.

Leaf blackening, which causes little, if any, damage is attributed to *Clasterosporium* [*Sporodesmium*] *putrefaciens* [ibid., 7, pp. 132, 759; 20, p. 617], but the author found only *Alternaria tenuis*. Leaf yellowing is caused by *Fusarium argillaceum* [*F. solani*: ibid., 15, p. 764; 25, p. 367] and *Gibberella saubinetii* [*G. zeae*].

Bacterial gummosis [cf. ibid., 29, pp. 343, 344] occurs sporadically and appears to have been serious in the vicinity of Ferrara in 1947–8; the causal organism has not yet been determined.

Khristova (Eleonora). Мозайката по Цвеклото в България. [Beet mosaic in Bulgaria.]—*Rev. Inst. Rech. sci. Minist. Agric., Sofia*, 18, 1, pp. 89–100, 4 figs., 1950. [French summary.]

In Bulgaria beet mosaic is prevalent in the beet-producing districts of Gorna Oryakhovitza, Rusen, Shumen, and Sofia, causing serious losses especially to the seed crops, which are often reduced by 50 per cent. The symptoms, host range,

properties of the virus, and the mode of transmission resemble those described by Hoggan [*R.A.M.*, 12, p. 674] and Pound [ibid., 27, p. 270].

The beet mosaic virus was detected in a number of hosts including chard [ibid., 28, p. 431], *Beta vulgaris* subsp. *crassa*, *B. procumbens*, *B. vulgaris* var. *rubra*, *Amaranthus retroflexus*, *A. albus*, *A. monstrosus*, *A. paniculatus*, *A. albus* var. *roseus*, *A. aureus*, *Atriplex hortensis* and its var. *atropurpurea*, *Chenopodium botrys*, and *C. ambrosioides*. The susceptible beet varieties include Peragis Runkenrübe, Diutches, Bares Teutonia, Mamutka Červena, Chotovice zehum, Eckendorf Yellow, Sakharose, Colosos, Kirshes-Colos, local sugar beet, sugar beet Nos. 572, 511, 4813/64, 5852/102, 512, 106, Enzhe original Nos. 128 and 501, Gol-1, Gol-2, and Gol-3; those of spinach Victoria, Matador, Universal, and King of Denmark.

The tolerance of the virus to dilution was 1 in 400, thermal death point 45° to 50° C., and longevity *in vitro* (at 18° to 20°) 24 to 30 hours.

Both *Aphis fabae* and *Myzus persicae* were found to be effective vectors. The incubation period was 11 to 14 days.

New crops should be planted at least 1,000 to 2,000 m. away from seed crops.

Ali (M. A.). **Genetics of resistance to the common Bean mosaic virus (Bean virus 1) in the Bean (Phaseolus vulgaris L.).**—*Phytopathology*, 40, 1, pp. 69–79, 2 figs., 1950.

In the course of studies which have been in progress since 1947 at the Department of Genetics, University of Wisconsin, crosses were made between the susceptible Stringless Green Refugee and the resistant U.S. No. 5 Refugee, Idaho Refugee, and Robust bean (*Phaseolus vulgaris*) varieties to determine the mode of inheritance of resistance to bean mosaic virus [*R.A.M.*, 21, p. 112].

Following inoculation by rubbing, the crosses Stringless Green Refugee × No. 5 Refugee and Stringless Green Refugee × Idaho Refugee showed an F_2 ratio of 3 resistant:1 susceptible, with no difference between the reciprocal matings. From these results a one-dominant gene difference controlling the resistance of the varieties in question may be postulated. Crosses between Stringless Green Refugee and Robust yielded an F_2 ratio of 1 resistant:3 susceptible, while the F_3 families fell into a distribution of 1 healthy:2 segregating (1H:3D):1 diseased, indicating that resistance in Robust is governed by a single recessive gene. Crosses between the two types of resistant varieties gave an F_2 ratio of 13 resistant:3 susceptible by the rubbing method of inoculation. However, using Grogan and Walker's approach-graft technique [ibid., 29, p. 285], the above-mentioned ratio was broken down into 9 necrotic (U.S. No. 5 Refugee and Idaho Refugee type of reaction):4 healthy (Robust reaction):3 mottled (Stringless Green Refugee reaction). The F_3 families from the cross Robust × U.S. No. 5 Refugee were distributed as follows: 7 healthy:4 segregating (13H:3D): 2 segregating (3H:1D): 2 segregating (1H:3D):1 diseased. These data point to two pairs of independently inherited gene differences, with dominant and recessive epistasis.

The following factorial scheme is presented in explanation of the foregoing results. A dominant gene *A*, imparting susceptibility to the tissues, is requisite for virus infection. Another dominant gene *I*, in combination with *A*, inhibits symptom expression following inoculation by friction or natural field infection and conditions top necrosis given a continuous supply of virus inoculum (provided by approach-grafting). The presence of gene *a* (acting as a recessive epistatic) confers resistance both to mosaic symptoms and top necrosis.

On this basis, the genotypes of the four varieties used are: Stringless Green Refugee, *AAii* (susceptible); U.S. No. 5 Refugee and Idaho Refugee, AAII (field-resistant, top-necrotic); and Robust, *aaii* (resistant, no top necrosis). The genetical behaviour of the various crosses is interpreted accordingly.

Systemic necrosis was shown by histological examination of the necrotic plants to be largely confined to the phloem tissue, while no trace of necrosis was discernible in either mottled or healthy plants. The necrotic response following graft inoculation is conditioned by gene *I* only in the presence of *A*. Plants with the genotypes *aaI-* or *aaii* remain healthy, while those with *A-ii* develop mosaic symptoms.

THOMAS (W. D.). **Studies on the host range of the Colorado red-node virus.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 1, p. 40, 1949.

Of 53 plants tested for their capacity to serve as hosts of the Colorado red node virus of bean [*Phaseolus vulgaris*: *R.A.M.*, 29, p. 345], the following gave positive results: five crop plants, namely, okra [*Hibiscus esculentus*], tobacco, cucumber, squash, and vegetable marrow; four ornamentals, i.e., dwarf French marigold [*Tagetes patula*], Picardy *Gladiolus*, *Caragana* sp., and black locust [*Robinia pseudo-acacia*]; and some common weeds, viz., *Plantago lanceolata*, *Tribulus terrestris*, *Chenopodium album*, *Convolvulus arvensis*, and *Grindelia squarrosa*. The virus induced a red local necrosis on *T. patula* and *Chenopodium album*, a streak on *Gladiolus*, and mottling or vein-clearing on all the other hosts. Four further species were found to act as carriers: *Kochia scoparia*, *Taraxacum officinale*, *Amaranthus retroflexus*, and *Melilotus alba*. Red node symptoms were obtained in cross-inoculations with the following plants showing symptoms of virus infection in the field: *A. fruticosus*, *R. pseudo-acacia*, *Caragana* sp., *Lactuca pulchella*, *Tribulus terrestris*, *Physalis lanceolata*, *Convolvulus arvensis*, *Franseria discolor*, and *Taraxacum officinale*.

MATHUR (R. S.), BARNETT (H. L.), & LILLY (V. G.). **Sporulation of Colletotrichum lindemuthianum in culture.**—*Phytopathology*, 40, 1, pp. 104–114, 1 graph, 1950.

On many natural and synthetic media the sporulation of the bean [*Phaseolus vulgaris*] anthracnose fungus, *Colletotrichum lindemuthianum*, tends to be sparse and erratic [*R.A.M.*, 2, p. 24; 4, p. 157]. In studies at the West Virginia Agricultural Experiment Station on the 'gamma' strain [ibid., 3, p. 110] the pathogen produced an abundance of conidia on a substratum containing glucose (2·8 gm.), mineral salts, and 2 gm. neopeptone, which proved equally effective for the purpose in view with sterilized bean pods or bean agar. The substitution for glucose of equivalent quantities of sucrose, xylose, or galactose did not reduce the amount of sporulation, but mannose, maltose, fructose, and lactose were less favourable and soluble starch, mannitol, and sorbitol unsuitable. None of the other sources of nitrogen tested were equal to neopeptone as stimulants of sporulation; urea was the next best, followed in decreasing order of efficacy by glycine, arginine, asparagine, and sodium nitrate. No conidia were formed below pH 3, but sporulation increased suddenly at 3·6, reached a maximum between 5·2 and 6·5, and occurred in moderation at 7·7. The process was not affected by variations in light and aeration.

KENDRICK (J. B.) & MIDDLETON (J. T.). **Gray mold of Lima Beans.**—*Phytopathology*, 40, 3, pp. 228–234, 2 figs., 1950.

During 1948 a severe outbreak of grey mould caused by *Botrytis cinerea* occurred on Fordhook Concentrated Lima beans (*Phaseolus lunatus*) in a field in Ventura County, the principal production area for this crop on the southern coastal plain of California.

A laboratory experiment carried out at the Division of Plant Pathology, University of California, demonstrated the importance of contaminated extraneous organic matter in initiating infection of leaves, pods, stems, and petioles. The majority of infection sites noted in the field were caused by blossoms having become attached to other plant parts, thus lending additional evidence of the importance of the flowers in contributing to the spread of the disease. This is the only part

capable of being infected at any stage of maturity, subsequent infection taking place rapidly under highly humid conditions.

The control measures recommended are based on proper cultural practices rather than the application of dusts [*R.A.M.*, 25, p. 558] which prove ineffective unless plants are spaced to allow adequate coverage and good air circulation. Fields adjacent to that highly infected with grey mould and containing the same variety of Lima bean but grown in rows 30 in. apart with late alternate-row irrigation and a lower level of fertility and consequently less dense vine growth, showed only a trace of infection.

LEHMAN (S. G.). **Purple stain of Soybean seeds.**—*Bull. N.C. agric. Exp. Sta.* 369, 11 pp., 2 figs., 1950.

Soy-bean purple stain (*Cercosporina kikuchii*) [*R.A.M.*, 4, p. 714; 27, p. 403], first found in Korea in 1921, was recorded in Indiana in 1924 and in North Carolina in 1927 (1 per cent. affected), since when it has occurred in Illinois, Maryland, Delaware, Virginia, and South Carolina. Since 1940 the percentage of seeds with purple stain in North Carolina has greatly increased [ibid., 9, p. 23] and at present, 50 per cent. of certain varieties may be found affected.

Infected seeds present a pink or light purple to dark purple discoloration which may affect only a small part or all of the seed coat, and penetrates to the inner surface. When seeds are heavily infected a light stain may appear on the surface of the embryo seedling. Spores from diseased seedlings produce angular, reddish-purple spots on leaves of adjacent plants. New crops of spores on affected leaves cause stem, petiole, and pod infections. The Ogden variety usually shows a much higher percentage of diseased seeds than Roanoke.

Soy-bean seed, visibly diseased or not, should be treated with arasan or spergon (2 oz. per bush.) before planting. This will largely prevent seedling losses. Arasan has given slightly better results than other materials.

BURKHOLDER (W. H.). **Sour skin, a bacterial rot of Onion bulbs.**—*Phytopathology*, 40, 1, pp. 115–117, 1950.

An onion bulb rot generally known as 'sour skin' from its vinegar-like odour is becoming prevalent in New York State. In the Yellow Globe variety decay is restricted to some of the outer fleshy scales, the inner, leaf-producing scales being apparently immune from both natural and artificial infection. In double bulbs, however, the storage scales in the centre between the two growing regions may be attacked. The slimy, yellow aspect of the rotted bulbs is quite distinct from the watery, glassy appearance imparted by *Pseudomonas alliicola* [*R.A.M.*, 21, p. 325]. The upper portion of the bulb may shrink, and in advanced stages of infection the outer dry skin easily slips off during handling, leaving the inner part firm.

The organism isolated from the diseased scales is a strictly aerobic, non-sporulating, straight, Gram-negative, uni- to triflagellate rod with rounded ends, occurring singly or in pairs, 1 to 2·8 (average 1·9) by 0·8 μ. On beef extract-peptone-agar slants the colonies are sulphur-yellow, filiform, of a butyrous to slightly viscid consistency and rough appearance. A water-soluble, yellow to yellow-green pigment diffuses into the surrounding agar. The characters of the bacterium on some other media are described.

Gelatin is slowly liquefied. Good growth is made in tryptone broth, but neither indole nor hydrogen sulphide is produced. Nitrates are reduced to nitrites. Ammonium salts, nitrates, and peptone are utilized as sources of nitrogen, and asparagine as a combined source of carbon and nitrogen. In Koser's medium without the citrate the organism utilizes arabinose, xylose, dextrose, laevulose, lactose, maltose, sucrose, glycerol, mannitol, and salicin, as well as the sodium salts of citric, hippuric, malonic, and tartaric acids. Starch is not hydrolysed. Growth is

good in beef extract-peptone broth plus 3 per cent. salt, but a 5 per cent. concentration inhibits development. The minimum, optimum, and maximum growth temperatures are below 9°, about 30°, and 42° C., respectively. The sour skin pathogen appears to be distinct from any of the bacteria hitherto described on onions and is accordingly named *Pseudomonas cepacia* n.sp.

SMITH (P. G.). **Downy mildew immunity in Spinach.**—*Phytopathology*, 40, 1, pp. 65–68, 1 fig., 1950.

All the 19 commercial varieties of spinach tested at the Division of Truck Crops, University of California, Davis, for resistance to downy mildew (*Peronospora spinaciae*) [*P. effusa*: *R.A.M.*, 29, p. 244] proved highly susceptible. Large populations of Prickly Winter, Viroflay, and Giant Nobel, moreover, yielded no indication of resistance in inoculation experiments in 1946–7. Immunity was, however, found in two lots of uncultivated spinach collected in Persia by the Division of Plant Exploration and Introduction, United States Department of Agriculture. The results obtained from the first cross, between immune plants of unknown genetic constitution and the susceptible Prickly Winter and Viroflay, and from immune F_1 segregates back-crossed to the susceptible types, showed immunity to be inherited as a single dominant gene.

BÖNING (K.). **Massnahmen zur Bekämpfung des Schwarzwerdens der Rettiche und der Halsfäule des Kopfsalats.** [Measures for the control of black root of Radishes and neck rot of Cabbage Lettuce.]—*Pflanzenschutz*, 1, 13, pp. 155–158, 4 figs., 1949.

A concise description is given of the morphology and modes of infection of *Aphanomyces raphani* and *Sclerotinia minor*, the respective agents of radish black root [*R.A.M.*, 18, p. 725] and lettuce collar rot [ibid., 17, p. 433] in Bavaria, where the two diseases together are responsible for an average annual loss of a third of the crop, which is valued at DM 2,000,000 in the Munich district alone. The following local factors influence the course of the diseases: the continuous cultivation of the two crops and the consequent accumulation of the pathogens in the soil; an unbalanced scheme of soil amendments, with predominance of stable manure; and a strongly alkaline soil reaction, resulting in the development of certain groups of micro-organisms at the expense of others. The control of the two fungi presents considerable difficulties, and the measures hitherto adopted for this purpose have proved inadequate or impracticable. Long-term (10- to 12-year) experiments planned at the Bavarian Institute of Agriculture were interrupted by the war but have since been resumed, and a tabulated account is given of the results obtained to date.

The average percentages of radish black root in five crops on eight plots receiving various soil amendments were as follows: (1) complete mineral fertilizer 15 (final soil reaction pH 7·45); (2) stable manure only 34 (7·84); (3) acid mineral fertilizer 8 (7·06); (4) complete fertilizer plus lime 17 (8·10); (5) complete fertilizer with calcium nitrate 15 (8·12); (6) complete fertilizer with calcium nitrate and stable manure 19 (7·99); (7) stable manure only 34 (7·96); and (8) formalin [ibid., 19, p. 512] 8 (7·49). All the plots were on garden soil, with a high humus content in (6) and (7). The average percentages and weights of saleable radishes in the same plots were (1) 57 (3·4 kg. per bed); (2) 40 (2·3); (3) 53 (3·2); (4) 50 (3·1); (5) 54 (3·2); (6) 55 (3·3); (7) 40 (2·3); and (8) 58 (3). An experiment to determine the effects of excess and deficiency of the various fertilizers on the incidence of *A. raphani* gave the following results: (1) complete fertilizer (50 per cent. potassium salt, sodium nitrate, and phosphate): five-year average percentage of black root 39; of saleable radishes 31; average weight 1·9 kg.; final soil reaction 7·83; (2) minus potassium 35, 27, 1·5, and 7·78, respectively; (3) double potassium 23, 45, 2·8, and 7·77; (4) potash, quarter nitrogen, phosphorus 37, 27, 1·3, and 7·59; (5)

potash, double nitrogen, phosphorus 35, 37, 2·5, and 7·38; (6) potash, nitrogen, double phosphorus 31, 32, 2, and 7·43; (7) complete fertilizer (ammonium and potassium sulphates and phosphate) 33, 33, 2, and 7·78; and (8) the same with double potassium 24, 38, 2·4, and 7·72.

The average percentages of collar rot in seven crops of lettuce given the soil amendments listed in the first radish black root test were (1) 21, (2) 22, (3) 32, (4) 14, (5) 8, (6) 7, (7) 28, and (8) 3. Excess and deficiency as indicated above resulted in the following percentages of infection by *S. minor* in four lettuce crops: (1) 5, (2) 5, (3) 6, (4) 8, (5) 12, (6) 11, (7) 16, and (8) 7.

It is clear from the foregoing data that both fungi are favoured by a high humus content of the soil and the unbalanced use of stable manure, but they differ in their soil reaction requirements, the development of *A. raphani* being hindered, and that of *S. minor* stimulated, by acid fertilizers. *A. raphani* does not respond to the application of lime, which reduces the incidence of *S. minor*. Excess potash not only lowers the percentage of infection by *A. raphani* but increases yields; it is, however, without influence on *S. minor*. Excess nitrogen tends to increase the amount of collar rot of lettuce, but is beneficial rather than otherwise in the treatment of radish black root, especially in consideration of the augmented yields. Calcium nitrate retards the development of both fungi and exerts a similar effect on *S. sclerotiorum*, which is concerned to a lesser extent than *S. minor* in the etiology of collar rot [ibid., 24, p. 350].

Tjallingii (F.). **Virusziekten van Komkommerachtige gewassen, in het bijzonder van Augurken.** [Virus diseases of Cucumber-like crops, especially of Gherkins.] —*Meded. Direct. Tuinb.*, 12, 8, pp. 584–593, 1949. [English summary.]

Cucumber mosaic virus is one of the most widespread and destructive diseases of gherkins in Holland. Besides the typical mosaic symptoms, wilting and necrosis may also develop, but only during a 'critical phase' lasting for a few days towards the close of the incubation period (one to two weeks after infection in the field) and under dull, cool weather conditions, with maximum day temperatures below 20° C. Once a plant has developed mosaic it will never wilt.

The gherkin virus is transmissible by at least four species of aphids, of which *Myzus persicae* is the most important. The reactions to inoculation with the virus were studied in its own host, cucumber, melon, squash, tomato, tobacco, annual lupins, spinach, *Primula obconica*, and *P. veris*, and are briefly described. The principal winter hosts of the virus are probably marsh plants, including *Valeriana officinalis*.

No completely immune gherkin or cucumber varieties have been found. The highly resistant Japanese variety Tokyo is unsuitable for pickling, but it has been crossed with the very susceptible commercial Baarlose Nietplekker in the hope of obtaining a reasonably tolerant type.

Wilson (C.). **Peanut seed treatments.**—*Plant Dis. Reptr*, 34, 4, pp. 87–95, 1 fig., 4 graphs, 1950. [Multilithed.]

After mechanical shelling when most of the split and undersized groundnut seeds have been removed, those remaining pass over a moving canvas belt and most of the visibly damaged seed is removed by hand. When planted, however, many seeds are damaged on the surface and are susceptible to attack by soil-borne fungi. They also carry inoculum of saprophytic or weakly pathogenic fungi such as species of *Fusarium*, *Sclerotium*, *Alternaria*, *Curvularia*, *Basisporium*, and *Rhizoctonia* [*R.A.M.*, 27, p. 171]. Invasion of the seed by micro-organisms is retarded by the use of seed protectants, although the value of the treatment is apparently limited to its protective action during the time the seed is in the soil. No evidence is presented to show that seed treatment controls post-emergence damping-off of

groundnuts. Although groundnut seed has been reported to carry inoculum of *Cercospora personata*, *Sclerotium rolfsii*, and vascular wilt fungi, there is no evidence that seed-borne inoculum of these fungi plays an important role in reducing groundnut stands. Seed treatment does not satisfactorily control any of these diseases.

Experiments carried out in Alabama from 1944 to 1949 indicated that machine-shelled seeds are practically as good as hand-shelled if they are treated with a suitable seed protectant prior to planting [ibid., 27, p. 65; 28, p. 326]. The best emergence was obtained generally from seed treated with 2 per cent. ceresan or ceresan M. Over-dosage with mercurial treatments decreased emergence below that of untreated seed, but over-dosage with Dow 9B, spergon, arasan, or phygon had no appreciable ill effect.

The response to seed treatment varied according to climatic conditions, treatment being very effective in 1946 and 1949 when conditions for germination were poor, but scarcely effective in 1947 when climatic conditions favoured good germination so that there was less need for protection. Seed shelled and treated in mid-February germinated as well when planted in mid-April as seed shelled and treated one day before planting.

Alvarez García (L. A.). **The control of Rhizoctonia damping-off of Pepper and Eggplant in Puerto Rico.**—*J. Agric. P. R.*, 30, 2, pp. 69–96, 3 figs., 4 graphs, 1946. [Spanish summary, pp. 92–95. Received March, 1950.]

Damping-off of pepper (*Capsicum annuum* and *C. frutescens*) and eggplants in seed and plant beds and in the field in Puerto Rico appears to be caused by a strain of *Rhizoctonia* [*Corticium*] *solani* [cf. *R.A.M.*, 26, p. 281; 28, pp. 110, 499] and possibly other organisms. The disease was serious during the first three to seven days after seedling emergence, and then declined. Recently emerged seedlings displayed a soft, wet, dark stem rot near soil level, which soon spread upwards, seldom down, affected seedlings toppling over and dying. In older plants, which withstood the disease much better, the infected stem tissues turned dark and became shrunken. In the field many plants succumbed during heavy rain. *C. solani* was very active under the local climatic conditions, i.e., a yearly temperature range of 26° to 30° C. and a high soil and air moisture content, especially round Rio Piedras where these conditions obtained.

The organism grew well at different pH values, particularly when they were near neutrality. Steam sterilization of soil for three hours at 15 lb. pressure effectively prevented infection. Formaldehyde (1 in 20) was especially effective. To prevent re-contamination applications of Bordeaux mixture (4–4–50) at ½ gal. per sq. ft. during the first week after the seedlings emerge should follow soil sterilization.

Semesan, Z-O [? zinc oxide], dipdust (2 or 6 per cent. hydroxy-mercury chlorophenol sulphate), cuprous oxide, copper carbonate, zinc oxide, semesan jr, arasan, fermate, and spergon used as seed disinfectants prevented pre-emergence damping-off only. Soil treatments with spergon, Du Bay 1155 H.H. (ethyl mercury iodide 5 per cent.), zinc oxide, Bayer 1494, semesan, dipdust, 2 per cent. ceresan, Z–O, uspulun, fermate, Dupont No. 1, cupric oxide, copper carbonate, arasan, new improved ceresan, cuprous oxide, barbak D, cuprocide, and semesan jr. prevented damping-off in naturally infected soil.

Ciccarone (A.). **Gravi danni da Pythium ultimum Trow nei pressi di Roma.** [Serious losses caused by *Pythium ultimum* Trow in the neighbourhood of Rome.]—*Notiz. Malatt. Piante, 1950*, 9, p. 26, 1950. [Mimeographed.]

In March, 1949, *Pythium ultimum*, not previously recorded in Italy, was isolated from the roots of severely wilted watermelons and chilli peppers (*Capsicum annuum*) growing in hotbeds and under glass near Rome.

Ciccarone (A.). **Osservazioni epifitologiche sui gravi avvizzimenti del Carciofo, verificatisi nella Riviera Ligure di Ponente.** [Epiphytological observations on the serious wilt of Artichoke noted on the western Ligurian Riviera.]—*Notiz. Malatt. Piante, 1950*, 8, pp. 3–6, 1950. [Mimeographed.]

In November, 1948, and October, 1949, artichokes (*Cynara scolymus*) at Coldirodi, Ligurian Riviera, became severely infected by *Oidiopsis* [*Leveillula*] *taurica* [cf. *R.A.M.*, 21, p. 404; 26, p. 532; *et passim*], though the disease has not before caused serious loss in Italy. The severity of the outbreaks is attributed to the prevailing weather conditions and to the fact that the crop was being grown in a locality not previously planted with artichokes and in close proximity to flowers.

Report Mushroom Research Station, Yaxley, for year 1949.—56 pp., 2 figs., 8 graphs, Mushroom Research Association Ltd., Yaxley, Peterborough, 1950. 5*s*.

Continuing his mushroom cropping experiments [cf. *R.A.M.*, 29, p. 195] R. L. Edwards found (pp. 8–15) that the addition of 38 lb. superphosphate per ton of straw at the fourth turn of the compost resulted in a considerable increase in the total yield of mushrooms, while the addition at stacking was ineffective. Although soluble hide meal and similar materials were not quite equal to dried blood as a source of nitrogen, they are worth further trial. Beds cased 24 days after spawning gave higher yields than those cased after 4 and 14 days. Composts stacked for five and six weeks gave rather more consistent results than those fermented for three and four weeks.

In the microbiological section (pp. 40–44) Catherine Duncan reports that many of the fungi attacking mushroom beds occur at definite times of the year. Verdigris [*Myceliophthora lutea*: ibid., 29, p. 196] appeared from the early part of the year to July, brown plaster mould (*Papulaspora byssina*) [loc. cit.] from April to October. Species of *Verticillium* [ibid., 28, p. 617] and *Mycogone perniciosa* [ibid., 27, p. 592] were most prevalent during August and September. *Pseudobalsamia microspora* [ibid., 27, p. 347], *Scopulariopsis fimicola* [ibid., 26, p. 281], and bacterial diseases occurred mainly in September and October, and *Sporendonema* sp. [ibid., 28, p. 616] mostly from September to November.

On pp. 45–48 R. L. Edwards gives directions for making synthetic compost and describes the preparation of the wheat straw, stacking, protection of the compost, and the composition of three activators (now available ready-mixed).

Costa (A. S.) & Bennett (C. W.). **White-fly-transmitted mosaic of Euphorbia prunifolia.**—*Phytopathology*, 40, 3, pp. 266–283, 2 figs., 1950.

In São Paulo, Brazil, the common weed *Euphorbia prunifolia* is affected at all seasons by a new virus disease characterized by light green, bright yellow, golden, or whitish mottling on a green background, either along the veins or in the interveinal areas. Reddish spots have also been noticed, mainly on leaves of old affected plants in the field. There is no appreciable reduction in the size of the plant or its parts; diseased plants blossom and set fruit normally. On young plants the first symptoms, consisting of rugosity and twisting of one of the young leaves, usually appear 6 to 12 days after infection, and are followed by vein-clearing, yellowing, and finally mottling. No case of recovery has been observed, although the symptoms are less striking on leaves produced as the plant matures.

The disease is of little economic importance on this host, but it may be that the virus occurs on locally-grown *Ricinus communis* or cassava, on which two viruses have already been described in Brazil [*R.A.M.*, 17, p. 724].

The virus is transmitted by the white fly, *Bemisia tabaci*. It was also transmitted to a low percentage of plants by juice inoculation, but not through seeds of diseased plants. The minimum incubation period of the viruses in the vector was 4 to 5

hours in two tests. It persisted in the vector for at least 20 days. The female white fly transmitted the disease almost twice as efficiently as the male. With ten insects to each plant 100 per cent. infection was obtained.

On the basis of known characteristics the virus of *Euphorbia* mosaic is designated as *Marmor conspicuum* n.sp. according to Holmes's system of nomenclature [ibid., 19, p. 229], and *Euphorbia* virus 1 according to that proposed by Smith [ibid., 17, p. 52].

Mazzei Patrone (I.). **Notas fitopatológicas. Control de la antracnosis de la Vid.** [Phytopathological notes. Control of Vine anthracnose.]—*Publ. mens. Direcc. Agron. Urug.* 100, 6 pp., 1 fig., 1950.

Vine anthracnose (*Gloeosporium ampelophagum*) [*Elsinoe ampelina*] is stated to have made considerable headway of recent years in Uruguay [*R.A.M.*, 15, p. 427]. Directions are given for its control by annual dormant applications, after the winter pruning operations, of one of the following: (1) Stawinsky's formula, consisting of 25 kg. iron sulphate and 2 kg. sulphuric acid in 100 l. water; (2) 3 per cent. sodium arsenite; (3) sulphuric acid of 1·665 density at 6 per cent. or of 1·834 at 3·45. Should the dormant application prove impracticable, the omission may be repaired by a pre-bud burst treatment of 15 per cent. lime-sulphur (28° to 30° Baumé) or 3 per cent. copper sulphate with 0·25 per cent. lime paste.

Wildman (S. G.) & Bonner (J.). **The electrophoretic detection of plant virus proteins.**—*Sci. Mon., N.Y.*, 70, 6, pp. 347–351, 6 diags., 1950.

An account is given of experiments which demonstrated that the presence of certain viruses, e.g., tobacco mosaic, C. C. Cheo's watercress virus of Chinese cabbage, cucumber mosaic, beet curly top, and citrus psorosis, in their host tissues is correlated with the appearance of a new and characteristic protein component in the electrophoretic scanning pattern of the cytoplasmic protein. In the case of tobacco mosaic virus the new component was isolated and shown to be the virus itself.

The association of the new protein with the presence of virus disease, whether or not it is always the virus itself, establishes the possibility of empirical diagnosis of the infective principle by electrophoretic examination of the cytoplasmic proteins.

Kennedy (J. S.). **Aphid migration and the spread of plant viruses.**—*Nature, Lond.*, 165, 4208, pp. 1024–1025, 1950.

Many field and laboratory observations indicate that aphids are not attracted to their hosts from a distance, and neither isolated hosts nor those in a crop should be regarded as the terminus of purposeful flights, but only as stopping places in a blind flow of migrants [*R.A.M.*, 29, p. 245]. Thus it cannot be assumed that winged aphids do not visit and feed on plants they do not colonize. Their behaviour suggests that they might, in theory, be the sole vector for a crop they do not colonize. It is concluded that in an aphid species its ability to transmit a virus and the abundance and activity of its winged forms are more important for spreading viruses than its potentialities as a direct pest of a crop.

Flik (H. M.) & Saaltink (G. J.). **De belangrijkste ziekten, plagen en beschadigingen bij landbouwgewassen in 1949.** [The most important diseases, pests, and injuries of agricultural crops in 1949.]—*Maandbl. LandbVoorl.*, 7, 6, pp. 241–250, 9 figs., 1950.

The dense stands and extensive lodging of cereal crops favoured by the open winter and mild, wet spring of 1948-9 in Holland [cf. *R.A.M.*, 28, p. 619] resulted in a high incidence of mildew (*Erysiphe graminis*) and rusts, especially *Puccinia*

graminis. Flag smut of rye (*Tuburcinia* [*Urocystis*] *occulta*) was prevalent in the frontier region of Elten and Sittard, but elsewhere this disease is seldom observed, thanks to seed treatment. Maize rust (*P. sorghi*) [ibid., 29, p. 20] is extending its range from the south, where it occurred sporadically, to other parts of the country.

An unfamiliar disease of flax caused by a species of *Verticillium* was observed in the north and has also been reported from Belgium. The leaves of young plants turn first yellow and then brown, while red-brown spots often appear on the stems and roots. The symptoms are transient, gradually disappearing as the season advances, and the crop resumes normal growth. Other fungi are associated with the *Verticillium* in diseased plants, mostly *Alternaria* spp., occasionally *Fusarium* or *Botrytis*. Rust (*Melampsora lini*) was so destructive in places that the crop became unsaleable.

The sudden wilting and death of lupins at flowering time was again attributable to *F. oxysporum* [? f. *radicis-lupini*: ibid., 29, p. 415]. Rye grass [*Lolium*] was extensively attacked by *P. coronifera* [*P. coronata*]. Potato viruses were less in evidence in 1949 than in 1948 owing to the paucity of aphids, a fact that was reflected in the larger certified area, viz., 29,743 out of 33,576 ha. or 88·6 per cent. as compared with 34,989 out of 47,704 (73·4).

Clamp rot of beets, which has been responsible for substantial reductions in the fodder supply of recent years, was found to be due in most instances to *Botrytis cinerea*, *Sclerotinia sclerotiorum* and *Helicobasidium purpureum* being only occasionally implicated. Heart rot [boron deficiency: ibid., 14, p. 732] developed in localities hitherto unaffected, e.g., North Friesland and the clay soils of the South Holland islands. Virus yellows [ibid., 28, p. 620; cf. also 29, p. 394] was widespread in August, especially in late-sown crops, attacking up to 100 per cent. of the plants in North Brabant.

Alternaria brassicae caused heavy losses in seed crops of cabbage, mustard, and turnip. [Turnip] mosaic virus [ibid., 29, p. 403] was observed on the last-named in Gelderland, North Brabant, and Limburg, this being the first record for Holland: the diseased plants mostly occurred in 'nests'.

GOULDEN (C. H.). **Progress Report 1938-1948, Cereal Division, Central Experimental Farm, Ottawa.**—77 pp., 20 figs., 1950.

In the section of this report dealing with the work of the Central Laboratory, Ottawa, it is stated that during 1947, the increased average yield of spring wheat in the five eastern provinces of Canada is largely attributable to the introduction of high-yielding varieties resistant to stem rust [*Puccinia graminis*], such as Coronation and Coronation II, produced from a Marquis × Pentad cross made originally at the Dominion Laboratory of Cereal Breeding, Winnipeg. These two, together with Regent, Redman [*R.A.M.*, 29, p. 457], and Saunders (all resistant to stem rust) are replacing the older varieties. Some of the parent varieties being used in the spring wheat breeding programme are Canus, resistant to bunt [*Tilletia caries* and *T. foetida*]; Hope × Timstein, resistant to leaf [brown] rust [*P. triticina*] and stem rust (including some resistance to race 15 B [ibid., 26, p. 385]), with moderate resistance to bunt and loose smut [*Ustilago tritici*], and some resistance to mildew [*Erisyphe graminis*]; Jumillo [ibid., 25, p. 258] and *Ae*[*gilops*] *cylindrica*, resistant to brown and stem rusts; and McMurachy, resistant to race 15 B of stem rust. Cornell 595 [ibid., 29, p. 457] is not resistant to bunt, and grain statistics indicate that bunted wheat is still being produced in Ontario. Ottawa 2619A (D.G.C.^{2} × Ridit) possesses considerable resistance to brown rust, but is susceptible to loose smut.

In breeding for rust resistance in winter wheats one hybrid line, Ottawa 3042 D5–3, from the combination Dawson's Golden Chaff × R.L. 704 (H. 44–24 × Marquis), proved resistant to brown and stem rusts, covered smut, and mildew,

and moderately resistant to loose smut. One combination from it, Cornell 595 × F_1 of Cross 3854 (Junior strain 6 × 3042 D 5–3–1), now in the F_4 generation, is being processed.

Of 100 oat varieties tested over a three-year period only Gopher, Mabel, Exeter, and Same were highly resistant to grey speck (manganese deficiency) [loc. cit.].

In the programme of barley crosses laid down in 1947 particular attention was paid to mildew resistance [loc. cit.], and artificial epidemics were devised. Under these conditions the most resistant varieties were early ones, which were shorter strawed than the standard varieties, but yielded better only in the presence of mildew.

Pasmo disease of flax [*Sphaerella linorum*: ibid., 28, p. 455; 29, p. 291] has occurred in Manitoba yearly since 1942, and heavy infections have developed on varieties tested at Morden and Winnipeg. In 1947 a pasmo nursery was established, using methods and material supplied by Dr. W. E. Sackston of the Laboratory of Plant Pathology, Winnipeg [cf. ibid., 27, p. 323], but no lines have yet been found with greater tolerance than C.I. 1153, though a few appear to show some resistance under natural conditions.

No registered pea variety containing more than 2 per cent. infection by *Ascochyta* [*pisi*: ibid., 29, p. 457] may be sold as seed. The amount of foundation stocks produced in some years is, therefore, very small, but in years when the disease rating is low there is usually about 30 bush. of Arthur seed to supply the trade.

In co-operation with the Division of Plant Pathology of the Science Service and the Division of Horticulture, four bean (*Phaseolus vulgaris*) nurseries have been established for [testing resistance to] common blight [*Xanthomonas phaseoli*: ibid., 26, p. 476; 28, p. 26; 29, pp. 133, 201], halo blight [*Pseudomonas medicaginis* var. *phaseolicola*: ibid., 27, p. 456; 28, p. 44] and anthracnose [*Colletotrichum lindemuthianum*: ibid., 28, p. 151; 29, p. 190]. The material tested was rather susceptible to both blights; in the anthracnose nursery, Norwegian, Yellow Eye, and Red Kidney remained unaffected, while Michelite, Robust, Corvette, and Burbank showed less infection than some other varieties.

In the section dealing with the work of the Dominion Laboratory of Cereal Breeding, Winnipeg, an account is given of the progress effected since 1939 in breeding rust-resistant varieties of wheat. One of the most promising fixed lines appears to be R.L. 2564, developed from the cross R.L. 2265 × Redman[3] and resistant at all stages of growth to inoculations with all the physiologic races of stem rust, including race 15 B, and the virulent races of brown rust. The best derivates from the back-cross programme have been crossed with high yielding, widely adapted varieties, such as Thatcher [ibid., 29, p. 80] and Mida × Cadet (R.L. 2344) in order to excel the yield and adaptability of Redman. They have also been crossed with wheats having other genes for resistance to stem rust and brown rust, such as Hope × Timstein (Minn. 2776) and Frontana. In this way derivatives have been developed in which resistance to most physiologic races of stem and brown rusts is at least duplicated in a given genotype. The inheritance of the near immunity from loose smut in Thatcher in the cross Redman × Thatcher was ascertained to be governed by a single major gene.

In breeding disease-resistant varieties of durum wheat two promising derivatives were obtained from the backcross R.L. 1742 × Carleton[2] made in 1944, R.L. 3047 (awned) and R.L. 3048 (awnless). They equal Carleton in resistance to stem and brown rusts and are of satisfactory quality, though R.L. 3047 is susceptible to bunt.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, 60, 11, pp. 595–600, 2 figs., 1949.

A description is given of the symptoms and control of club root of crucifers (*Plasmodiophora brassicae*) [*R.A.M.*, 20, p. 103]. The disease is not serious in New

South Wales, occurring only sporadically in coastal and tableland areas. In the metropolitan area it has been recently recorded on swedes.

E. M. Hutton gives an article on the symptoms and control of leaf curl of peach and nectarine (*Taphrina deformans*) [ibid., 28, p. 446], which was extremely prevalent in most parts of the State in 1949, particularly in Cumberland county. Complete control [cf. ibid., 22, p. 469] can be achieved by spraying at bud swell or a little earlier with 15–15–100 Bordeaux mixture plus ½ gal. white oil, or with lime-sulphur (1 gal. to 20 gals. water). Copper oxychloride was also effective.

New plant disease records include *Sclerotinia homoeocarpa* [ibid., 29, p. 86] on *Festuca rubra* var. *fallax* and *Agrostis tenuis*; *Puccinia graminis tritici* on *Amphibromus neesii*; [tomato] spotted wilt virus on *Aristolochia elegans* and China aster; *Phyllosticta asteris* on China aster; *Phytophthora cinnamomi* causing shoot blight of *Azalea mollis*; [tomato] big bud virus on *Calendula officinalis* and *Dianthus barbatus*; *Coryneum cardinale* on *Cupressus macrocarpa* [ibid., 28, p. 495]; *Colletotrichum orchidacearum* on *Cymbidium*; *Puccinia cynodontis* on *Cynodon dactylon* [ibid., 28, p. 360]; *Verticillium dahliae* on *Hibiscus esculentus*; a (?) fern leaf mosaic virus on *Pteridium aquilinum*; and *Mycosphaerella ribis* and *Verticillium albo-atrum* on currants.

Plant diseases.—*Agric. Gaz. N.S.W.*, 60, 12, pp. 646–650, 5 figs., 1949.

Dwarf French beans [*Phaseolus* spp.] were regarded as resistant to rust (*Uromyces phaseoli typica*) [*U. appendiculatus*: *R.A.M.*, 22, p. 91] in New South Wales until October, 1948, when Tweed Wonder was found severely affected by a new strain of the fungus in the Gosford–Wyong district. Later it was reported from other localities of the Gosford district, from the Hawkesbury Agricultural College, and the Murwillumbah district on the North Coast. So far Tweed Wonder, Brown Beauty, Wellington Wonder, Hawkesbury Wonder, and Clarendon Wonder have been attacked. In areas in which the new strain has become established dusting seedlings (two or three days after emergence) with sulphur at 15 to 25 lb. per acre is recommended, repeating the applications at intervals of one to two weeks until a few days before flowering. Spraying with wettable sulphur is also effective. Diseased crops should be burned or ploughed under immediately after harvesting. In districts where the new strain has not yet appeared plants should be watched carefully until they begin to flower, and treated as soon as the first symptoms are noticed.

The following oat varieties are stated to show good field resistance to loose and covered smut [*Ustilago avenae* and *U. kolleri*: ibid., 25, p. 296]: Ballidu, Belar [loc. cit.], Brigalow, Bunya, Guyra, Kareela, Karrajong, Lampton, Mulga, and Sunrise [loc. cit.]. Dale and Gidgee are moderately resistant.

In the spring of 1949, 10 to 20 per cent. of certified Sebago potato seed in the Clarence river district was infected with black leg (*Erwinia carotovora*) [ibid., 20, p. 292; 28, pp. 306, 478, 555; 29, p. 276]. Factor and Katahdin growing in the same area were relatively free from infection. It is concluded that the outbreak in Sebago was due either to varietal susceptibility or to the unusually large size of the seed. Tuber transmission is considered unlikely to occur.

Report on explanatory investigations of agricultural problems of Alaska.—*Misc. Publ. U.S. Dep. Agric.* 700, 185 pp., 90 figs., 2 maps, 1949. [Received May, 1950.]

In the section of this report (p. 137) dealing with insects and diseases in Alaska [*R.A.M.*, 29, p. 407] it is stated that greenhouses, hotbeds and cold frames of home gardens are remarkably free from plant diseases, but there are cases of trouble from damping-off of seedlings in the early spring. Greenhouse tomatoes were affected by mosaic [(?) tobacco mosaic virus], blue mould [? *Peronospora tabacina*],

mildew [leaf mould: *Cladosporium fulvum*], sclerotium rot [*Sclerotinia sclerotiorum*], and blossom-end rot. Cucumbers were attacked by mosaic [virus], mildew [*Erysiphe cichoracearum*], and sclerotium rot. Scab [*Actinomyces scabies*] is the most serious disease of potatoes (p. 139) in the Tanana valley, but ring rot [*Corynebacterium sepedonicum*] has recently been found. Blight [*Phytophthora infestans*] was very destructive in south-eastern Alaska in 1946.

Most of the crucifers (p. 144) seem relatively free from destructive diseases and spraying or dusting is rarely necessary. Club root [*Plasmodiophora brassicae*] was seen at Wrangell.

Tipburn and slime are serious diseases of lettuce. Control by means of resistant varieties, irrigation, or soil fertilization and cultivation is an important problem. Seed-borne mosaic [virus] has been seen. Seedling damping-off causes heavy loss in some seasons. Early blight of celery (*Cercospora apii*) was found in the summer of 1946 in one field in the Matanuska Valley where overhead irrigation had been practised.

Mildew [*E. polygoni*] and leaf blights [? including *Ascochyta pisi*] of peas are very prevalent in south-eastern Alaska.

Plant pathology.—*Rep. N.Y. St. agric. Exp. Sta. 1949*, 68, pp. 20–28, [? 1950].

In this report [cf. *R.A.M.*, 28, p. 445] H. C. Young states that an indexing programme has been established to provide nurserymen in New York State with virus-free foundation stocks of sour cherry. The Triogem peach variety will replace Elberta as testing stock, surpassing it in expressing the rosette character of cherry yellows [ibid., 28, pp. 223, 464]. In the first indexing tests 16 Montmorency sour cherry trees were selected and yielded budwood for 200 trees in 1948.

According to J. M. Hamilton, the 1948 season in north-western New York favoured fungicidal tests for the control of apple scab [*Venturia inaequalis*: ibid., 28, pp. 445, 460, 469; 29, pp. 101, 262, 367]. Organic fungicides were much more effective than inorganic, and fermate better than wettable sulphur. Z 78 was inferior to fermate, while compound 341 C [loc. cit.] gave good control without lime, though the addition of lime is recommended until compatibility with insecticides is established. Puratized agricultural spray, puratized B, tag fungicide No. 331, and phygon, applied after infection periods of 60 hours' duration, gave remarkably good control. Tag fungicide No. 331 was the most effective; phygon caused foliage injury, premature bursting of terminal buds, and poor fruit coloration even at a concentration too low to control scab. The addition of micronized sulphur improved control with puratized. Tag fungicide No. 331 ($\frac{1}{4}$ pint) with micronized sulphur 3–100 should be a good mixture. A mixture of sulphur or fermate with puratized was more protective than puratized alone; tag fungicide No. 331, impregnated on a carrier, was very effective as a dust.

D. H. Palmiter states that 1948 was considered the worst year for scab experienced in the Hudson Valley for a long time. Many growers used 15 to 18 applications of wettable sulphur to obtain the same degree of control as was given by nine applications of better materials. All combinations used gave better control than sulphur alone. The combinations with karbam (70 per cent. ferric dimethyl dithiocarbamate) [ibid., 27, p. 510], Z 78 (70 per cent. zinc ethylene bis-dithiocarbamate), and 70 per cent. manganese ethylene bis-dithiocarbamate produced the cleanest fruit, as they caused no visible injury. In laboratory tests on infected leaves elgetol and D–289 gave complete control. Infection percentages of quince rust [*Gymnosporangium clavipes*: ibid., 24, pp. 265, 404] assessed on 18th June on McIntosh apple fruits sprayed against scab with puratized agricultural spray, puratized B, HL 331, and phygon plus fermate were, respectively, 13·3, 15·1, 4·3, and 0, while on Cortland the corresponding figures were 20, 26·6, 7·4, and 0.

In work by A. J. Braun Concord vines sprayed in 1947 and 1948 with Bordeaux mixture 4–4–100 and 8–8–100 and fermate 1–100 and 2–100 showed cumulative effects. Applications immediately before and after bloom and seven to ten days later gave 95 to 100 per cent. control of black rot [*Guignardia bidwellii*: ibid., 28, p. 445] (infection in the unsprayed in 1947 and 1948, 28 and 8 per cent., respectively). Bordeaux mixture decreased vine growth as measured by shoot and petiole lengths and pruning and petiole weights; it delayed ripening. Fermate increased vine growth. Berry size was decreased by Bordeaux mixture and increased by fermate when powdery mildew [*Uncinula necator*: ibid., 29, pp. 197, 203] was not present. In 1948 the fermate-sprayed vines yielded more than the unsprayed, while those sprayed with Bordeaux yielded less. Early applications of fermate decreased the retarding effects of later applications of Bordeaux mixture.

In four years' tests lime-sulphur (8–100, 4–100, and 2–100) satisfactorily controlled raspberry anthracnose [*Elsinoe veneta*: ibid., 24, p. 457; 28, p. 528] when applied as the blossom buds appeared. Fermate 2–100 and zerlate 2–100 applied when the new canes were about 12 in. tall and again as the blossoms opened gave excellent control on the branches of the topped canes without injuring the foliage. The applications were too late to prevent infections on the basal portions of the canes. Bordeaux mixture 4–4–100, COCS 2–100 [copper oxychloride sulphate: ibid., 27, pp. 31, 39, 173; 28, p. 483], and Tennessee '26' 2–100 [ibid., 21, p. 148; 23, p. 70] controlled branch infection but caused severe foliage injury.

W. T. Schroeder investigated the possibility of improving the adhesion and distribution pattern of zerlate on tomato foliage with various adjuvants by correlating disease control data with the evaluation of the fungicide deposits as determined by a chemical leaf print method. A correlation was established between leaf deposit ratings and control of *Alternaria* [*solani*] defoliation, with one exception, B. 1956 giving better control than could be predicted from the leaf prints. Orthol-K [ibid., 28, p. 313], orthol-D, and veg-oil were outstanding from the standpoint of deposit ratings and control of *A. solani* defoliation.

In the report on seed investigations on p. 43, W. F. Crosier states that *Helminthosporium* [*Pyrenophora*] *avenae* was occasionally found in seed stocks of oats tested in 1948–9 [cf. ibid., 27, p. 519; 29, p. 299]; apparently it occurs in insignificant amounts in certain seed stocks produced in New York State. It has persisted in seeds of Victory oats stored in a warm laboratory since 1945. *A. tenuis* was present on most seed stocks [of oats] grown in New York, irrespective of the variety. *Fusarium culmorum* was detected repeatedly in oats grown in 1948, even in certified lots of Advance, Clinton, and Mohawk. Barley seed of the 1948 crop was injured by *H. sativum* and *F. culmorum*; the latter vegetated upon and killed wheat seedlings in one-third of the 1948 germination tests. Several species of *Alternaria*, especially *A. dianthi*, *A. dianthicola*, and *A. resedae* [ibid., 28, p. 160], as well as strains of *A. tenuis*, were found in seeds of *Dianthus* spp. Species of *Ascochyta*, *Phoma*, and *Sphaeronema* produced pycnidia on the surface of various kinds of seeds. *Botrytis cinerea* was very common in seeds of China aster [ibid., 27, p. 511]. *Diplodia zeae* and *G*[*ibberella*] *saubinetii* [*G. zeae*: ibid., 27, p. 510] were again present in a few maize seed stocks grown in New York State; their continual presence emphasizes the need for crop rotation and seed treatments. Sclerotia of *Rhizoctonia* [*Corticium*] *solani* [loc. cit.] were discovered on seeds of red kidney bean [*Phaseolus vulgaris*] from California. *Colletotrichum lindemuthianum* [loc. cit.] increased in importance, being present in five lots [of bean seed] tested from New York State and at least three from other States. *Ascochyta* spp. continue to be introduced into the State on pea seed. Mechanically injured flax seeds derived benefit from applications of ceresan M [ibid., 27, p. 574], N[ew] I[mpoved] ceresan, phenyl mercury bromide, phenyl mercury acetate, leytosan, and other experimental or recently introduced fungicides.

Milbrath (D. G.). **Bureau of Plant Pathology.**—Ex *Rep. Dep. Agric. Calif., 1949* (*Bull. Dep. Agric. Calif.*, 38, 4), pp. 237–260, 1949.

In this report [cf. *R.A.M.*, 28, p. 562] G. E. Alstatt, A. Schlocker, and B. W. Lee state that during the annual survey for incipient plant diseases in 1949 no internal cork of sweet potatoes [ibid., 28, p. 408] was found in California. Onion smut (*Urocystis cepulae*) [ibid., 28, pp. 7, 379, 471, 498] was detected for the first time in October, five separate outbreaks being discovered, all in the same area.

The first external symptom of a disease of grapefruit trees in Coachella Valley reported in December, 1948, was a blister-like protrusion of the bark of the trunk. The bark could be removed intact and appeared to be normal. The inner xylem layers appeared as sheets of amber or yellowish-amber, gum-filled cells. Deeper in there were sometimes quite extensive necrotic areas or pockets bordered by narrow, yellow to apricot-orange to salmon pink bands. Externally longitudinal cracks up to ½ in. developed in the bark of the blister. Under the bark a beady, callus-like proliferation of tissue extended from the wood into the bark for about the length of the crack, and 1 to 2 mm., or slightly more, outwards from the wood. Green pigment was present in the depression in the bark and in the proliferated wood tissues. In more advanced cases gum exuded. Secondary symptoms consisted in a general decline of the whole tree. Badly affected trees ceased to produce marketable fruit. The condition appears to be closely similar to Rio Grande disease in Texas [cf. ibid., 27, p. 361] and for the present is referred to as 'wood necrosis'. An extensive survey of nine counties revealed that the group of symptoms observed in the Coachella Valley occurred as a whole only in that valley and a few localities in the vicinity. Elsewhere the salient symptom was the blister-like protrusion of the bark, wood necrosis being absent or inconspicuous and no apparent injury caused. The use of affected trees as sources of budwood must be avoided.

No evidence of any virus disease of papaws could be discovered through field examination.

D. M. Coe, dealing with virus disease elimination in stone fruit nursery trees, states that efforts are being concentrated on the selection of acceptable sweet cherry budwood, and the area from which final selection was to be made was reduced to 94 acres; after a final inspection, the trees visibly free from virus or virus-like diseases were marked for budwood selection.

G. L. Stout states that in 1949 more new cases of peach mosaic (2,527 on 570 infected properties, 207 of which were newly infected properties) were found than in any year since 1941, but this increase and that recorded in 1948 [ibid., 28, p. 562] are regarded as temporary, as the general trend in the number is downwards. On 21st October, a revision of the Quick Decline of Orange Interior Quarantine [ibid., 28, p. 62] was issued to include in the quarantine the whole commercial citrus area of Los Angeles, Orange, and San Bernardino counties and most of the citrus areas in Riverside County, including all districts where suspect trees were found. The list of restricted hosts includes the sweet and sour orange, mandarin (*C. reticulata*), grapefruit, pummelo (*Citrus grandis*) [*C. maxima*] and lemon groups, their varieties and flowering forms, and any hybrids having at least one parent of such species.

The blisters of cherry bark blister [ibid., 26, p. 530; 27, pp. 355, 466], which now appears to be due to a virus, are of two kinds. Some are turgid with gum, elongated along the branch, and up to ½ in. or more long; they often break and exude gum, after which elongated, rough, protruding cankers sometimes develop, as if from the broken blisters. The other kind, more common and particularly characteristic, is circular to irregular, slightly raised up to 1 mm. above the surrounding bark, and flattened on top. This type is often reddish-brown in spring; as the season progresses such blisters become dry and collapsed or sunken. Usually they occur singly, but they are often grouped and may coalesce. After bud inoculations in August and September, 1947, from diseased orchard trees to young cherry trees, typical

necrotic and yellow chlorotic spots developed on Bing leaves, but not on Black Tartarian or Mahaleb; smaller, paler, necrotic leaf spots appeared on Mazzard seedlings similarly inoculated. In November, 1948, leaves on inoculated Bing trees showed the typical late-season colour pattern of green spots and blotches. Early in the spring of 1949 the inoculated Bing trees and some inoculated Mazzard seedlings developed typical bark blisters and necrotic spots or patches on the bark. In many instances blistering and necrosis were very severe, and sometimes buds, spurs, and small shoots were killed; gumming often occurred.

Infected buds were also placed, in the autumn of 1947, in Mazzard and Mahaleb seedlings. Bing and Tartarian buds from healthy trees were also placed in these seedlings during the same season and were forced in the spring of 1948. Typical leaf spot symptoms appeared in 1948 on some shoots from the Bing buds, and in 1949 typical bark blisters developed. When the buds from affected orchard Bing trees inserted in Mahaleb seedlings were forced, shoot symptoms occurred which were indistinguishable from those on other Bing shoots on the inoculated trees. Inoculations into peach failed to produce any symptoms.

Memoria anual del año 1947. [Annual report for the year 1947.]—*Rev. industr. agríc. Tucumán*, 37, 1–12, pp. 23–39, 1947. [Received June, 1950.]

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, 28, p. 54]. The suspected occurrence in Argentina of *Fusarium moniliforme* [*Gibberella fujikuroi*] on sugar-cane [ibid., 27, p. 44] was confirmed, the varieties affected including Tuc. 4363 and others deriving from 31. Sugar-cane mosaic virus was also observed in varying degrees of intensity. A special commission was appointed by the Ministry of Agriculture in March, 1947, to plan and co-ordinate studies on sugar-cane smut (*Ustilago scitaminea*) in co-operation with technologists from the Tucumán Agricultural Experiment Station and other interested organizations.

Tomato plants were sprayed, at intervals of 20 to 25 days throughout the growing season, with 2 per cent. DDT for the control of the insect vector [*Frankliniella paucispinosa*] of black pest [spotted wilt]. The incidence of the disease in the treated plot was 4 to 5 per cent., as compared with 60 to 70 in the control.

Nowogrudski (D. M.). **Mykolytische Bakterien aus den Pseudomonasarten.** [Mycolytic bacteria of the *Pseudomonas* species.]—*Bull. Acad. Sci. U.R.S.S.*, Biol. Ser., *1949*, pp. 237–259, 1949. [Abs. in *Chem. Zbl.*, 121, 15, p. 1112, 1950.]

Mycolytic bacteria, which consist almost exclusively of species of *Pseudomonas* [*R.A.M.*, 20, p. 534], may be isolated from soil and plant samples on potato agar. The dissolution of 12 species of fungi was effected by 53 strains of bacteria thus obtained, the process being accompanied by the secretion of thermolabile substances. Mycolysis was accomplished by the most active strain in the course of a few days. The organisms occur in both virgin and cultivated soils, their numbers fluctuating between 0 to 100 and 10,000 to 100,000 per gm., the populations found under fallow and legumes being larger than those under cereals and root crops. The activity of the mycolytic bacteria retards the development of many soil fungi and reduces the number and virulence of the pathogenic species, e.g., *Fusarium*.

Bard (R. C.) & McClung (L. S.). **Preparation of media.**—*Pure Cult. Study Bact.*, 18, 1–2, 24 pp., 1950.

Another leaflet in this series [cf. *R.A.M.*, 29, p. 145] is the tenth edition of leaflet II, completely re-written in an attempt to describe growth media, which have proved to be of general value to bacteriologists, for the benefit of those unfamiliar with the problems of bacterial cultivation. Following a discussion on the growth

requirements of bacteria, general procedures in media preparation are described together with details concerning the composition and preparation of media for cultivation and storage, enrichment, differential techniques for determining physiological properties, and for special purposes.

Manil (P.) & Straszewska (Zofia). **Effects de l'acide dichlorophénoxyacétique (2-4-D) et de l'acide indoleacétique sur les tumeurs due à Phytomonas tumefaciens Smith et Townsend.** [Effects of dichlorophenoxyacetic acid (2–4–D) and indoleacetic acid on the tumours due to *Phytomonas tumefaciens* Smith & Townsend.]—*C.R. Soc. Biol., Paris*, 144, 3–4, pp. 311–313, 1950.

Particulars are given of experiments at the Agronomic Institute, Gembloux, Belgium, the results of which clearly demonstrated the stimulatory action of indoleacetic acid, and to a lesser extent of dichlorophenoxyacetic acid (2–4–D), on the growth of tumours in sunflower plants inoculated with *Phytomonas* [*Bacterium*] *tumefaciens* [cf. *R.A.M.*, 22, p. 198; 26, p. 335; 27, p. 329, *et passim*].

Rudd Jones (D.). **On the nomenclature and identity of the coliform soft-rot bacteria.**—*Trans. Brit. mycol. Soc.*, 33, 1–2, pp. 73–81, 1950.

Pathogenicity and biochemical tests were carried out at the Botany School, Cambridge, with 28 strains of coliform soft-rot bacteria, including *Bacterium carotovorum* [*Erwinia carotovora*: *R.A.M.*, 29, pp. 252, 276], *Bact. phytophthorum* [*E. phytophthora*: loc. cit.], and *Bact.* [*E.*] *aroideae* [ibid., 28, p. 51]. The author concludes that the two last-named organisms are strains of the first species. Under standard conditions of high temperature (20° C.) and high humidity all caused rotting of iris rhizomes and onion slices and nearly all rotted tomato and potato plants and potato tubers, irrespective of their ability to ferment maltose. The amount of blackening of potato stems or tubers varied considerably even with the same strain. Three of 14 strains tested, *E. aroideae* isolated from tobacco in Uganda [ibid., 17, p. 296] and two from potato, caused rotting of arum petioles; they did not correspond to *E. aroideae* in biochemical characters. All strains grew on ethyl alcohol agar, but only two (from potato) produced acid. All except two produced acid and gas in sorbitol, and all produced acid in glycerol. All the strains from potato tubers at the time of isolation formed acid and gas in glucose, sucrose, and salicin, but some lost this ability later; 16 of 25 fermented maltose with the formation of acid and gas on isolation (but only eight did so a year later), two produced acid only, and seven did not ferment maltose. The single strain of *E. aroideae* failed to form gas on all carbohydrate media tested. All gave methyl red negative and Voges-Proskauer positive reactions in O'Meara's fumarate medium.

Melchers (L. E.). **Smuts of cereal and forage crops in Kansas and their control.**—*Bull. Kans. agric. Exp. Sta.* 332, 36 pp., 15 figs., 1 diag., 1948. [Received May, 1950.]

This useful publication (a revision of *Bull. Kans. agric. Exp. Sta.* 279) contains the essential information, presented in semi-popular form, on the economic importance, etiology, symptomatology, life-histories, and control of the smuts of cereal and forage crops in Kansas.

Cook (L. J.). **Results of replicated trials with Wheat varieties 1948-49 and 1949-50.** —*J. Dep. Agric. S. Aust.*, 53, 10, pp. 431–436, 1950.

Day (H. R.). **Farming results at Minnipa seed Wheat farm season 1949-50.**—ibid., 53, 10, pp. 437–441, 1950.

These two articles summarize the results of large-scale trials with the most promising wheat varieties, including a number of disease-resistant ones, in South

Australia. Dirk 48 [*R.A.M.*, 28, p. 622], a new, early-maturing wheat variety derived from a Ford × Dundee cross and producing high quality grain, was grown at all centres during 1949. Since its resistance to rust [*Puccinia graminis*: ibid., 29, p. 150] is derived from Gabo it will remain resistant only as long as Gabo maintains its resistance. When multiplied, Insignia 49, a rust resistant strain of Insignia bred by the Waite Agricultural Research Institute, will be useful to replace Ranee 4H.

Holton (C. S.). **Observations on Neovossia indica.**—*Indian Phytopathology*, 2, 1, pp. 1–5, 3 figs., 1949. [Received June, 1950.]

In this study in the United States on *Neovossia indica* [*R.A.M.*, 27, p. 315; 28, p. 160], the agent of partial bunt of wheat in India, the spore material was obtained from the Plant Industry Station, Beltsville, Maryland, supplied by Dr. B. B. Mundkur, New Delhi. The specimens had been collected by M. A. Khan at Karnal, India, in 1942. Chlamydospore germination of the fungus was induced by soaking the spores in tap water at room temperature for one week, followed by incubation on 2 per cent. water agar at room temperature for seven days. Unbranched promycelia developed, ranging in length from less than 10 μ to several hundred μ, and bore at the apex an average of 117 primary sporidia (range 26 to 171). Of several hundred primary sporidia only one fused pair was observed. At least eight distinct culture types were distinguished among 90 monosporidial lines originating from one promycelium. Sectors, permanently distinct from the parent lines, occurred in some. Most of the primary sporidia were binucleate, some being uninucleate. The secondary sporidia were mostly uninucleate, only occasional ones having two or three nuclei. Attempts to hybridize *Neovossia indica* and *Tilletia caries* failed.

Bedi (K. S.), Sikka (M. R.), & Mundkur (B. B.). **Transmission of Wheat bunt due to Neovossia indica (Mitra) Mundkur.**—*Indian Phytopathology*, 2, 1, pp. 20–26, 1949. [Received June, 1950.]

The results of experiments conducted during 1947 and 1948 at Gurdaspur confirmed previous findings that 'Karnal bunt' (*Neovossia indica*) [see preceding abstract], herein renamed partial bunt, is air-borne [*R.A.M.*, 23, p. 10]. In artificial soil infection tests in which the seed of the variety C591 was used, partial bunt developed in both inoculated and control plots, while ears protected with paper bags remained free from infection. In a crop raised from artificially and naturally infected seed of the same variety, all the ears that had not been bagged became infected. C591, C228, I[mperial] P[usa] 165, and Punjab T7 inoculated with sporidia of *N. indica*, using Moore's vacuum method [ibid., 15, p. 567] in the anthesis stage (bagged prior to and after inoculation), developed 100, 50, 33, and 50 per cent. infection. Ears that had been bagged but were not inoculated remained healthy.

Of 54 wheat varieties tested for resistance at the Gurdaspur, Kangra, and Gumar farms in 1948, the durum wheats, Punjab Types 1, 2, and 3, were immune in all localities. Even under natural conditions of infection they showed 100 per cent. resistance. The incidence of the disease is heavy in irrigated and manured fields (up to 30 per cent.), while in non-irrigated fields with little or no manure there is little partial bunt (2 per cent.). Observations made over a period of years indicate that when abundant rains occur in March, when the wheat flowers are in the anthesis stage in East Punjab, the disease appears in an epidemic form. Development of resistant varieties appears to be the only method of control.

Glynne (Mary D.). **Sharp eyespot as a severe disease of Oats.**—*Nature, Lond.*, 166, 4214, p. 232, 1950.

During the year many plants in a crop of oats in Bedfordshire were severely attacked by a *Rhizoctonia* resembling that obtained from sharp eyespot in wheat

(*Corticium solani*) [*R.A.M.*, 22, p. 426]. This fungus does not appear to have been recorded on other cereals in Great Britain [cf. ibid., 27, p. 187]. The lesions resemble those in wheat, but the fungus penetrates deeply into the tissues of leaf sheaths and straws, rotting the shoots. Some barley and wheat plants scattered among the oats showed typical superficial sharp eyespot lesions, but their growth appeared to be unimpaired. In sand culture experiments in which wheat, barley, oats, and rye were inoculated with two isolates of *C. solani* obtained from sharp eyespot in wheat, lesions developed on the leaf sheaths of all four cereals but oats and rye were more severely affected, the fungus penetrating more deeply into the shoots and killing about half the inoculated seedlings.

Jones (L. H. P.) & Leeper (G. W). **The availability of various manganese oxides to plants.**—*Science*, 111, 2887, pp. 463–464, 1950.

The authors compared several manganese oxides for their ability to supply manganese to oats when mixed with soils on which oats had failed through manganese deficiency [*R.A.M.*, 27, pp. 359, 583; 29, p. 18]. The effects ranged from zero for hausmannite to complete cure with manganous manganite.

Christensen (J. J.) & Schneider (C. L.). **European Corn borer (Pyrausta nubilalis Hbn.) in relation to shank, stalk, and ear rots of Corn.**—*Phytopathology*, 40, 3, pp. 284–291, 3 figs., 1950.

Stalk, shank, and ear rots of maize are commonly associated with injuries caused by the European corn borer (*Pyrausta nubilalis*) in the maize-growing region of Minnesota. The spread of the insect has increased the amount of stalk rot and complicated the development of resistant varieties. Borers aid in the development of rots by providing an entry for fungi, particularly weak pathogens; the movements of the larvae distribute organisms inside the plant, the frass within larval tunnels serves as a medium for the rapid multiplication of the invading organisms and the borer injuries weaken the adjoining tissues, making them more susceptible to fungus attack. *Fusarium* spp. were by far the most common pathogens isolated from infested shanks, stalks, and ears, although *Gibberella zeae* [*R.A.M.*, 28, p. 170], *Diplodia zeae* [ibid., 28, p. 453], and other fungi and bacteria were prevalent. During the summer and autumn larvae were usually infested both internally and externally with several of the organisms associated with stalk rot.

Patel (M. K.). **Production of oospores by Sclerospora sorghi on Maize.**—*Indian Phytopathology*, 2, 1, pp. 52–57, 1 pl., 9 figs., 1949. [Received June, 1950.]

Most of the information on the production of oospores by *Sclerospora sorghi* in Kashmir Sweet maize has already been noticed from another source [*R.A.M.*, 28, p. 392]. It may be added that the oospores are usually scattered in the mesophyll tissues, in contrast to the linear arrangement in sorghum and other hosts where oosporic states of *S.* species occur.

Muller (A. S.). **Corn diseases in Guatemala.**—*Res. Bull. Ia agric. Exp. Sta.* 371, 597–602, 1949. [Spanish summary.]

Foliage diseases of maize in Guatemala include rust (*Puccinia sorghi*) [*R.A.M.*, 26, p. 197], which usually appears late, stripe (*Helminthosporium turcicum*) [see next abstract], causing considerable damage every year, and Guatemalan corn rust (*Angiopsora pallescens*) [ibid., 23, p. 316], which is widespread and caused much damage in the lowlands on the Pacific coast in 1947. Its control and biology are unknown. *Phyllacora maydis* [loc. cit.], *Cercospora sorghi*, and *Physoderma zeae-maydis* [*P. maydis*; ibid., 11, p. 431] are prevalent but not serious. Smut (*Ustilago zeae*) [*U. maydis*] annually destroys from 1 to 2 per cent. of highland and lowland

maize. *Sorosporium reilianum* [*Sphacelotheca reiliana*: C.M.I. map No. 69] caused a 1 per cent. loss of ears in an experimental field in Antigua in 1947. Maize stunt virus disease [ibid., 28, p. 283] has been observed every year since 1941 in various parts.

Ear diseases include dry rot (*Diplodia zeae*) [ibid., 25, p. 71], which affected 10 to 20 per cent. of the ears in 1947 when the rains lasted till December. Pink rot (*Fusarium moniliforme*) [*Gibberella fujikuroi*] affects 1 to 5 per cent. of ears harvested and cob rot (*Nigrospora sphaerica*) usually 1 per cent. although 30 per cent. were attacked in 1947 in Barcena.

Melhus (I. E.), Semeniuk (G.), & Vestal (E. F.). **Helminthosporium turcicum leaf blight of Maize in Guatemala.**—*Res. Bull. Ia agric. Exp. Sta.* 371, pp. 615–625, 2 figs., 1949. [Spanish summary.]

Probably the most serious leaf disease of maize in Guatemala, especially between 4,000 to 6,000 feet, is *Helminthosporium turcicum* [*R.A.M.*, 26, p. 197], first found by the authors in 1945 in the San Antonio Huista and Jacaltenango regions of the Cuchumatanes mountains. In 1946 it was very destructive in the Coban region, 5 to 20 per cent. of the September crop being damaged, and in experimental plots near Guatemala City.

In three different climatic sites in 1946 and 1947 there was wide variation in the amount of blight, being most severe at Coban (4,200 feet, 120 in. rainfall) and least at Antigua (4,953 feet, 12·28 in.) in 1946. In 1947 the rainfall was higher at Antigua (33 in.) and there was more blight. It was severe at Coban and the National School of Agriculture on coast maize. Only five of 81 collections of maize at Coban were little diseased.

Highland maize developed the least blight at the three sites. 47A–46 had only a trace at Coban and the National School of Agriculture in 1946 and seemed to carry most resistance to the disease.

In trials in 1948 with United States, Guatemalan, and Guatemalan × U.S. inbreds, and one U.S. single cross, the U.S. inbreds and single crosses proved very susceptible. NC34 was the most resistant [ibid., 26, p. 12]. Guatemalan maize in field tests at Ames, Iowa, in 1948 proved more resistant than the U.S. single crosses.

Soumini (C. K.). **Investigations on cereal rusts—III. Puccinia purpurea Cke.**—*Indian Phytopathology*, 2, 1, pp. 35–38, 2 figs., 1949. [Received June, 1950.]

Puccinia purpurea [*R.A.M.*, 23, p. 360] commonly affects sorghum in Madras, Bombay, Bihar, and Central Provinces of India. In the Madras province it is most prevalent in the later stages of the crop. The sori are abundant only after a spell of rainy weather; uredosori are more common and develop profusely. In tests conducted at Coimbatore the uredospores lost their viability after 14 days at room temperature, and after 20 in a refrigerator. They germinated better at 26° to 29° C. than at 5°. Teleutosori usually develop in December and January and are sometimes formed in old uredosori. Paraphyses are present in both types of sorus. Fresh teleutospores germinated in 24 to 48 hours in drops of water or 1 per cent. sucrose solution at 23° to 25°. No alternate host of this rust has yet been discovered and teleutospore inoculations of various plants gave negative results.

Young sorghum plants (21 to 35 days) inoculated with uredospores developed symptoms after 8 to 15 days. In the field the disease was observed only on plants two to three months old.

Cross-inoculations with uredospores from *Sorghum durra* to *S. durra*, *S. halepense*, Sudan grass [ibid., 10, p. 653], *S. nitens*, *S. verticilliflorum*, and *S. arundinaceum* showed that the pathogen passes readily from one host to another. At the Millets Breeding Station, infection on various grain sorghums ranged from

5 to 100 per cent. *S. conspicuum*, *S. caffrorum*, *S. nigricans*, and *S. caudatum* were completely free from rust.

Ramakrishnan (K.). **Investigations on cereal rusts—II. Uromyces setariae-italicae (Diet.) Yoshino.**—*Indian Phytopathology*, 2, 1, pp. 31–34, 2 figs., 1949. [Received June, 1950.]

In this contribution [cf. *R.A.M.*, 29, p. 148] the author reports the results of his studies during 1947–8 of *Uromyces setariae-italicae* [*R.A.M.*, 20, p. 570], which occurred in epidemic form on *Setaria italica* in the Ceded districts of the Madras Province in 1944. Fresh uredospores germinated readily in water or 1 to 2 per cent. sucrose solution. Germination was markedly reduced when the concentration was increased above 3 per cent. At relative humidities of 1·5, 86, and 100 per cent. the uredospores lost their viability within a week. At 22 per cent. a few spores germinated after 15 days. Inoculation tests with suspensions of fresh uredospores resulted in abundant infection, the incubation period being seven days. *S. glauca* and *S. verticillata* did not become infected and in the field *S. glauca* plants, growing among severely infected *S. italica*, remained free from rust. Heavily infected *S. glauca* plants were collected from two localities but uredospores from these did not infect *S. italica*. It appears, therefore, that physiologic races of the rust are present.

No variety tested was immune from the pathogen. Co. 1 was less rusted than 4054, which was formerly considered resistant but had more than 50 per cent. infection. All other varieties were highly susceptible. The incidence of the disease is highest from November to January, especially if these months are wet.

Benton (R. J.), Bowman (F. T.), Fraser (Lilian), & Kebby (R. G.). **Stunting and scaly butt of Citrus associated with Poncirus trifoliata rootstock.**—*Agric. Gaz. N.S.W.*, 60, 10, pp. 521–526, 4 figs.; 11, pp. 577–582, 5 figs.; 12, pp. 641–645, 654, 5 figs., 1949; 61, 1, pp. 20–22, 40, 1950.

Trifoliate orange (*Poncirus trifoliata*) has been used for many years to a limited extent as a citrus rootstock in New South Wales, because it is resistant to *Phytophthora citrophthora* [*R.A.M.*, 23, p. 175; 28, p. 571] and for various cultural qualities. Its most serious defect, however, is the stunting of certain scion varieties, commonly associated with the development of scaly butt [cf. ibid., 27, p. 520] below the bud union. With Washington Navel orange, Thompson Navel orange, and Thompson grapefruit the incidence varies from 0 to almost 100 per cent. in some plantings. Late Valencia, St. Michael, and Australian Navel oranges have been generally satisfactory on *P. trifoliata*, although in two blocks of Valencia 10 to 50 per cent. of the trees, respectively, were affected. Emperor, Ellendale, and Unshiu (Satsuma) mandarins are also satisfactory, but Thorny and Clementine mandarins developed a high percentage of scaly butt. Eureka lemons on trifoliate orange are uniformly unsatisfactory, the disease affecting all trees at an early age. Lisbon lemons are also subject to the disease. There is considerable variation in the size of Marsh grapefruit trees on this stock.

At first small, elongated or scale-like dead areas appear in the outer bark of the stock below the bud union; the margins are subsequently surrounded by longitudinal fissures connected by horizontal cracks, the scales thus formed partially lifting from the bark beneath. The first scales may be developed singly or in groups. In very young trees the scales are up to 1 mm. thick, 3 to 8 mm. wide, and 10 to 25 mm. long. As the tree ages the scales become thicker and of variable shape and size, and adhere rather strongly to the butt. The rate of progress and the severity of scaling vary considerably. In the common severe type the first scales appear at about ground level and almost immediately spread upwards to the bud union. In older trees scaling extends along the roots and often whole roots die out. In other

cases scaling starts at or near the bud union, near the crown roots, at one side of the butt, or at ground level and only progresses very slowly up to the bud union. In affected trees the diameter of the stock is the same as or only slightly greater than that of the scion, but with lemons it is often smaller. Scaling develops four to eight years after budding; stunting of the scion is apparent at the same time. In the most extreme cases the trees do not exceed 4 to 5 ft. in height, and have rather sparse foliage. More often the foliage is reasonably dense but twig growth very short. Stunted trees crop well and the fruit is of normal size and very high quality. Affected *P. trifoliata* stocks very rarely develop suckers.

In transmission experiments scaly butt developed four years after union with affected material by inarching and budding, and with presumably infected material in reciprocal working (top-worked mature trees and budded nursery trees). The evidence indicates that the disease is caused by a virus present in the scion, which is symptomless except in combinations with *P. trifoliata*.

For the selection of virus-free grafting material buds from healthy, eight- to ten-year-old trees on trifoliate orange are recommended to obviate scaly butt in oranges, grapefruit, and mandarins. As all lemons appear to be affected, the use of seedling scions is to be studied.

Rodriguez Landaeta (A.). **'Sarna comun' o verrugosis de los Citrus.** ['Common scab' or verrucosis of Citrus.]—*Agric. venez.*, 13, 133, pp. 9–13, 4 figs., 1950.

One of the most prevalent diseases of citrus in Venezuela is scab (*Sphaceloma* [*Elsinoe*] *fawcetti*) [*R.A.M.*, 21, p. 324], the essential information on which is summarized under the headings of hosts, history and common names of the disease, geographical distribution [C.M.I. map No. 125], symptoms, etiology, mode of propagation, predisposing conditions, specific susceptibility, damage, and control.

Gogoi (Tilottama). **Observations on strains of Fusarium oxysporum from the Oil Palm and Banana from Central and West Africa.**—*Trans. Brit. mycol. Soc.*, 33, 1–2, pp. 121–131, 1 pl., 2 figs., 1950.

In further work at Manchester University with 33 isolations of *Fusarium* from seedling and adult oil palms in Nigeria and the Belgian Congo [*R.A.M.*, 29, p. 362] and with two cultures of *F. oxysporum* [f.] *cubense* from banana wilt in the Cameroons it was ascertained that four of the former were *F. solani*, one was *F. dimerum* [ibid., 19, p. 302; 22, pp. 405, 406], and 28 were *F. oxysporum*, which formed a close assemblage of strains. Evidence was obtained of mutation in the wild strains of *F. oxysporum*. The mutant forms sometimes showed only slight variations and sometimes differed widely from the parent both morphologically and biochemically, the mutant characters being retained. The development of pigment was affected by the carbon:nitrogen ratio in the medium, and the colour depended on the acidity. Acid reaction was not always necessary for pigment formation. In soil culture a wild strain maintained its original characters for a prolonged period.

The isolations of *F. oxysporum* f. *cubense* showed characters closely comparable with those of *F. oxysporum* from oil palm when the organisms were grown in standard synthetic medium [loc. cit.] and steamed rice grains. It appears that *F. oxysporum* may not be the sole pathogenic species of the genus associated with oil palm wilt.

Hutchinson (J. B.), Knight (R. L.), & Pearson (E. O.). **Response of Cotton to leaf-curl disease.**—*J. Genet.*, 50, 1, pp. 100–111, 1950.

In the first part of this paper Hutchinson and Knight record that a survey in the Sudan of the response to cotton leaf curl virus [*R.A.M.*, 29, p. 163] of 671 strains of cotton showed that *Gossypium arboreum* and *G. herbaceum* are immune, *G. hirsutum*

and its vars. *punctatum* and *marie-galante* are highly resistant, and *G. barbadense* contains a large proportion of susceptible strains.

Evidence is presented indicating that the disease reached the Sudan from West Africa through a chain of hosts along the north equatorial region and that the spread within the Sudan from one major cotton area to another was mainly along the riverain crops of *Hibiscus esculentus*.

The variability of the symptoms in West Africa [ibid., 6, p. 162], as compared with the uniformity in the Sudan, indicates that several virus strains may be involved. The first record of leaf curl in the Sudan was made by A. R. Lambert in 1924 in an unpublished report. He described the condition as 'stenosis' and stated that affected plants were stunted, the leaves and shoots curled and dwarfed, and the main stem often flattened and twisted. In Southern Nigeria mosaic and true leaf curl symptoms are often present on the same plant, whereas in experiments at Shambat they never appeared together, though they occasionally occurred on different plants of the same strain.

Many of the cotton strains tested possess a resistance which cannot have been developed under the selective impact of the disease, and it was demonstrated that the breeding of resistant types has been accomplished repeatedly by the accumulation of minor genes through selection. It would appear that even in susceptible varieties little change in the genotype is required to confer virtual immunity.

In an appendix Pearson states that during a visit to West Africa he observed three types of virus disease of cotton, corresponding roughly to those described in 1926 as bunchy top, mosaic, and leaf curl [loc. cit.]. Bunchy top was characterized by a progressive reduction in the size of all foliar and floral parts and of the internodes, with clogging of the main veins of the leaf. The stipules were of normal size. There was no mosaic or leaf crinkling. It was encountered in Nigeria and French Sudan on *G. barbadense* and *G. hirsutum*, in the Gold Coast on the former, and in French Cameroons and French Equatorial Africa (Oubangui) on the latter [*C.M.I.* map No. 25]. Mosaic appeared as a very fine pattern of dark and light green on the leaves, generally accompanied by swelling and clogging of the subveins, and sometimes by leaf-like outgrowths. There was some reduction of the leaves to single lobes and some indication of dwarfing, but no lengthening or twisting of internodes. Examples were seen on *G. barbadense* in Nigeria and on *G. hirsutum* var. *marie-galante* in the Gold Coast. With leaf curl the smaller veins become thickened on the lower surface and appear clogged when seen against the light; later the main veins may be similarly affected. Vein-thickening caused crinkling of the lamina, which became thick and leathery, and the margins curled, usually upwards. The extra-floral bracteoles showed the same symptoms. In extreme cases the internodes became lengthened, flattened, twisted, and ascendant, the leaves were small, and the flower buds fell off. Typical symptoms were seen on *G. barbadense* in Nigeria, Ivory Coast, and Gold Coast. The 'bunchy top' condition appeared readily distinguishable from the other two; these were not well differentiated and it was impossible to decide from field observation whether mosaic was an early stage of leaf curl or whether two distinct diseases were present. Cotton leaf curl has not yet been observed in Egypt. The appendix concludes with a review of the distribution of *Bemisia* on cotton in Africa.

Patel (M. K.) & Kulkarni (Y. S.). **Nitrogen utilization by Xanthomonas malvacearum (Sm.) Dowson.**—*Indian Phytopathology*, 2, 1, pp. 62–64, 1949. [Received June, 1950.]

Experiments at Poona College of Agriculture showed that *Xanthomonas malvacearum* isolated from cotton could utilize only ammonium citrate, nitrate, and sulphate, potassium nitrate, asparagine, and uric acid of 38 nitrogen sources in Richards's standard liquid medium. A species of *Actinodochium* from mango fruit,

Helminthosporium sativum and *Fusarium vasinfectum* from cotton, *F. udum* from pigeon pea, *F. orthoceras* from *Lathyrus sativus*, *Aspergillus niger*, and a species of *Penicillium* were less specific in their nitrogen requirements.

Cole (H. A.). **Shell disease in re-laid French Oysters.**—*Nature, Lond.*, 166, 4209, pp. 19–20, 2 figs., 1950.

Shell disease [caused by an unidentified fungus] has been prevalent in oysters in the Netherlands for some years and has caused serious mortalities since 1930. Korringa [*Ostreicult. Cult. mar.*, 16, p. 3, 1947] has frequently observed shell disease, identical with that occurring in the Netherlands, in French oysters offered for sale by planters in Brittany.

In the Menai Straits, N. Wales, and the Helford River, Cornwall, many oysters may be found with dendritic white markings, usually on both valves of the shell, like those of the early stages of shell disease. These markings, which are probably caused by a fungus related to that causing shell disease, have never been known to lead to any serious after-effects, loss of condition, or mortality, whereas Dutch shell disease disfigures the inside of the shell by producing extensive brown patches and warts, and leads to serious loss of condition and eventually death on reaching the muscle attachment.

Previous experience suggests that although there is little danger of Dutch shell disease spreading to British beds from the comparatively small numbers of seriously affected oysters now present, every care should be taken to avoid the importation of diseased stock in future. The progress of the disease on British beds should be carefully observed.

Peach (Mary). **Aquatic predacious fungi.**—*Trans. Brit. mycol. Soc.*, 33, 1–2, pp. 148–153, 11 figs., 1950.

Descriptions are given of *Dactylella reticulata* n.sp. [cf. *R.A.M.*, 29, p. 304] and *Dactylaria candida*, both capturing nematodes, and of *Acaulopage macrospora*, preying on amoebae (the two last-named being recorded in Great Britain for the first time).

Bakshi (B. K.). **Fungi associated with ambrosia beetles in Great Britain.**—*Trans. Brit. mycol. Soc.*, 33, 1–2, pp. 111–120, 3 pl., 2 figs., 1950.

Ceratocystis piceae n.comb. (syn. *Ceratostomella piceae* [*R.A.M.*, 24, p. 392; 29, p. 448] and *Ophiostoma piceae*), *Leptographium lundbergii* [ibid., 28, p. 16], and *Oedocephalum lineatum* n.sp. were constantly isolated from the galleries of *Trypodendron lineatum* in Japanese larch and Norway spruce (the first two fungi only) in different localities in Scotland. *Ceratocystis piceae* and *C. coerulescens* [n.comb.] (syn. *Endoconidiophora coerulescens*) were isolated from blued pine boards. *C. ambrosia* n.sp. was obtained from the tunnels of *T. domesticum* infesting birch. *L. lundbergii*, recorded in Britain for the first time, is a strong blueing agent, whereas *C. piceae* is a weak one [cf. ibid., 23, p. 368].

The mature mycelium of *O. lineatum* is purplish-brown, the young, hyaline, thin-walled hyphae, brown when old, being 2 to 6 μ broad. The thick-walled conidiophores average 180 (up to 220) μ in length and are 6 to 7 μ broad, swelling at the head to 15 μ. They may be non-septate or septate. The thick-walled, unicellular, colourless conidia are pear-shaped or round with pointed ends by which they are attached to the sterigmata; they measure 4·3 to 6·6 by 3 to 5·3 (average 5·4 by 4·2) μ.

The brownish-black mycelium of *C. ambrosia* bears unicellular, hyaline, elongate conidia measuring 4·7 to 14 by 2·7 to 5·7 (average 7·8 by 3·8) μ. The base of the young perithecium is brown and pseudoparenchymatous, becoming black and hairy when mature. The ventral diameter and height of the perithecial base vary from

109 to 221 (average 165) μ and 103 to 214 (157) μ, respectively. The length of the neck is from 240 to 924 μ, including cilia when present (average 490 μ), and the width at the base is 32 to 49 (37·5) μ and at the tip 9·8 to 15·4 (12·6) μ. Cilia (maximum 10) range from 21 to 25 μ (occasionally 10 μ) in length, are mostly uni- (rarely bi- to tri-) cellular, thin-walled, hyaline, 1·7 to 2·3 μ broad at the base, tapering to 0·8 to 1·2 μ at the tip. The unicellular, hyaline, reniform ascospores measure 3·8 to 5·3 by 1·3 to 2 (average 4·5 by 1·6) μ. The round, brown to black sclerotia are 50 to 65 μ in diameter. The fungus is heterothallic.

GILL (D. L.). **Effectiveness of fungicidal sprays and dusts in Azalea petal blight control.**—*Phytopathology*, 40, 4, pp. 333–340, 1950.

This is an amplified, tabulated survey, brought up to date by the inclusion of further tests, of a four-year investigation at Spring Hill, Alabama, on the control of azalea [*Rhododendron*] petal blight (*Ovulinia azaleae*), a note on which has already appeared [*R.A.M.*, 28, p. 293; cf. also 29, p. 415]. The efficiency of dithane D–14 spray, dithane Z–78, and parzate (both the latter in liquid or dust form) was confirmed.

TOMPKINS (C. M.) & MIDDLETON (J. T.). **Control of basal rot of cuttings of Chrysanthemum and other ornamentals.**—*Bull. Torrey bot. Cl.*, 77, 4, pp. 287–293, 1950.

Basal rot of chrysanthemum cuttings, a serious disease in parts of California [*R.A.M.*, 24, p. 60], is characterized by brownish-black, watersoaked lesions at or near the base of the cuttings. Infection spreads upward in the stems and downward into the roots, discolouring all tissues. Wilting may occur in advanced stages of the disease. Stem tissues become soft and shrunken and the cuttings collapse.

Low air and soil temperatures and excessive soil moisture appear to predispose cuttings to infection.

The causal organism was identified as *Pythium ultimum* [ibid., 29, pp. 309, 361], and its pathogenicity established. It was also isolated from infected cuttings of 19 genera in 18 families of ornamental plants.

Experiments carried out at Redwood City during 1944 and 1945, using cuttings of the varieties White Frost, Pink Masaka, Yellow Pompon, and Yellow Tea showed that the percentage of disease after dusting the basal ends with fermate, fermate plus celite 505 [loc. cit.], or stim-root was 2·3, 2·5, and 2·1, respectively, compared with 16·6 in the undusted. Clean or used sand may then be used in the propagating benches. Cuttings of 19 other ornamentals were rendered disease-free by using fermate plus celite 505. The mixture has been used on a commercial scale for three years with success and is now in general use.

PRICE (W. C.), MCWHORTER (F. P.), & STERANKA (BETTY). **Natural occurrence of Tobacco necrosis virus in Primrose.**—*Phytopathology*, 40, 4, pp. 391–392, 1950.

Many plants of *Primula malacoides* in the Phipps Conservatory, Pittsburgh, Pennsylvania, inspected in February, 1948, showed mottling and chlorosis of a type similar to that caused by cucumber mosaic virus. Only one of the attempts to transfer the virus by means of carborundum to the cotyledons of very young cucumber seedlings was successful, resulting in the development of a few white, sunken lesions which expanded into well-defined spots, about 4 mm. in diameter, with brown margins. Subinoculations from these spots to cucumber and other plants gave rise to many necrotic local lesions resembling those induced by tobacco necrosis virus on the same species [*R.A.M.*, 19, p. 668]. The virus in question was not that of cucumber mosaic. In February, 1949, the foliage of each of about 100 *P. malacoides* and 50 *P. obconica* plants, mostly with varying degrees of chlorosis,

was tested separately by subinoculation to cucumber seedlings. Only one *P. obconica* plant yielded a virus, which was identical in all particulars with that of the previous year.

The thermal inactivation point of the *Primula* virus was found to be above 85° C., at which temperature samples heated for ten minutes produced an average of 30 lesions per leaf on ten leaves of Turkish tobacco plants. It was still infectious after 11 days' drying in Early Garden Golden Cluster bean [*Phaseolus vulgaris*] leaves. Localized infection also developed in tests on *Coleus blumei*, *Nicotiana glutinosa*, *N. rustica*, *N. sylvestris*, *Salpiglossis sinuata*, *Sinningia speciosa*, *Vinca rosea*, and *Viola cornuta*.

From the results obtained to date, the host range and properties of the *Primula* virus appear to be identical with those of tobacco necrosis, not hitherto recorded as occurring naturally on any plant in the United States. The authors' observations agree with those of Bawden and Kassanis [ibid., 27, p. 22], except for the pathogenicity of the Pittsburgh isolate to *P. malacoides*.

Loos (C. A.). **Amphichaeta grevilleae n.sp., on Grevillea robusta seedlings.**—*Trans. Brit. mycol. Soc.*, 33, 1–2, pp. 40–42, 2 figs., 1950.

In September, 1947, *Grevillea robusta* seedlings 2 to 3 in. high growing in a nursery near Kandapolla, Ceylon, at an elevation of 6,500 ft. became completely defoliated. Attached leaves were severely blotched, and the necrotic areas, ranging from small specks to patches covering almost the whole leaf, bore black acervuli on both surfaces. The fungus is new and is named *Amphichaeta grevilleae* n.sp. The fusiform conidia, measuring 15·8 to 25 by 4·6 to 7 μ, are 4 to 5-septate, unconstricted, with the median cells coloured, terminal cells hyaline, and apical and basal setae 13 to 21 μ long; the basal seta is inserted near the point of attachment to the conidiophores, which are filiform, hyaline, and measure 12·6 to 15 by 1·3 μ. Inoculations of wounded leaves of adult plants gave positive results, the fungus being re-isolated.

Robertson (N.). **Echidnodes aulographoides (Bomm., Rouss. & Sacc.) Robertson comb. nov., in Britain.**—*Trans. Brit. mycol. Soc.*, 33, 1–2, pp. 107–110, 1 fig., 1950.

A fungus found by the author in the spring of 1944 and again in 1945 on living twigs, and once on a dead portion of leaf, of rhododendrons of the *ponticum* series, at Dawick, Peeblesshire, Scotland, agreed with the description and type specimen of *Lembosia aulographoides* Bomm., Rouss., & Sacc. (*Syll. fung.*, 9, p. 1107, 1891) in the Herbarium of the Brussels Botanic Garden and with the description and probable paratype of *Microthyrium rhododendri* Grove in Kew Herbarium [cf. *R.A.M.*, 20, p. 427]. A well-developed ground mycelium was demonstrated in all three. The presence of an external mycelium and the shape of the thyriothecium exclude the fungus from *Microthyrium*. All three are referred to the genus *Echidnodes* as *E. aulographoides* (Bomm., Rouss., & Sacc.) n.comb.

Ripe fructifications are found in early spring on newly formed bark, causing the latter to appear grey. The species is not considered to be seriously pathogenic. Chinese rhododendrons in the same area were not infected.

Thirumalachar (M. J.) & Narasimhan (M. J.). **Downy mildew on Eleusine coracana and Iseilema laxum in Mysore.**—*Indian Phytopathology*, 2, 1, pp. 46–51, 9 figs., 1949. [Received June, 1950.]

In November, 1944, the senior author collected several *Eleusine coracana* heads in Mysore, South India, showing marked proliferation of the floral parts due to

a species of *Sclerospora* [*R.A.M.*, 26, p. 393]. In a survey of *E. coracana* fields during November and December, 1945, many scattered diseased samples were collected, and in one field near Challekere 5 per cent. of the plants were infected. In 1948 a severe outbreak occurred in a small field near Bangalore, resulting in total loss of the crop.

The lower spikelets in the ear proliferate first, gradually involving in some cases the whole spike. The leafy shoots produced are upright and present a brush-like appearance. No shredding of the leaves has been observed. The pale, cinnamon-yellow, sparse, subglobose to spherical oogonia, formed in the mesophyll cells surrounding the vascular bundles, measure 34 to 70 by 36 to 62 μ, with a sinuous wall 3·5 to 4 μ thick. The usually single antheridia are not persistent. The spherical oospores with granular contents measure 35 to 60 μ in diameter; the wall is 2·5 to 3 μ thick and confluent with the oogonial wall. The fungus resembles *S. macrospora*, but as the conidial stage has not been observed naming the fungus is deferred.

The downy mildew caused by a species of *Sclerospora* on *Iseilema laxum*, a common pasture grass, has been found only in one locality near Nandi Hills, Mysore (4,800 ft.). The diseased plants are very conspicuous because of the dwarfing of the internodes, resulting in a witches' broom-like growth of the whole inflorescence. They are paler than healthy plants, but there is no shredding of the leaves. The conidial state has not been observed.

The numerous, pale golden-yellow, subglobose to spherical oogonia, 43 to 61 by 40 to 54 μ, have deeply folded walls 5·5 μ thick, tuberculate in surface view. The persistent, conical to triangular antheridia, two to five in number, measure 27 to 40 by 15·5 to 27 μ. The spherical oospore, 38 to 50 μ in diameter, is situated in the centre of the oogonium, the granular inner contents enclosing a few oil droplets. The hyaline wall, 3 to 3·5 μ thick, is confluent with the oogonial wall. The fungus is designated *S. iseilematis* n.sp.

Dillon Weston (W. A. R.). **Clover failure.**—*Farming, Norwich*, 4, 7, pp. 197–200, 220, 4 figs., 1950.

This is an account of the symptoms and control of clover rot (*Sclerotinia trifoliorum*) [*R.A.M.*, 29, p. 467] and stem eelworm (*Anguillulina dipsaci*) preceded by a brief survey of the history and distribution of clover sickness. In a survey of the relative distribution of these two, 62·3 per cent. of 138 samples from 'clover-sick' fields in Norfolk, Sussex, and Essex and other eastern counties were affected with clover rot only and in 26·1 per cent. both organisms were detected.

Hey (A.). **Probleme der Bekämpfung von Krankheiten und Schädlingen bei den Futterleguminosen.** [Problems of the control of diseases and pests in fodder legumes.]—*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 3, 5–6, pp. 106–109, 1949.

Most of the problems treated in this paper are concerned with the control of insect pests of fodder legumes, but a brief account is given of the so-called 'mid-German lucerne dying-off', a perplexing disease-complex of recent development which urgently calls for investigation. The plants, generally of older stands, assume a sickly aspect of indefinite symptomatology and mostly die off in part. Sections through the diseased plants uniformly revealed, in addition to insect injuries, a more or less advanced fungal decay of the plumule, associated principally with facultative parasites. Possible explanations of the disease are nutritional-physiological deficiencies or 'soil sickness'.

The great superiority of indigenous over imported seed in relation to disease resistance is emphasized in connexion with a discussion on the controversial question of provenance.

Rose (D. H.), Fisher (D. F.), Brooks (C.), & Bratley (C. O.). **Market diseases of fruits and vegetables : Peaches, Plums, Cherries and other stone fruits.**—*Misc. Publ. U.S. Dep. Agric.* 228, 27 pp., 12 pl. (6 col.), 1950.

This is a revision of the bulletin of the same title published in 1937 [*R.A.M.*, 16, p. 474]. The bibliography has been brought up to date, and a brief note is given on anthracnose, caused by *Glomerella* (?) *cingulata*, of southern-grown peaches (abs. in *Phytopathology*, 38, p. 22, 1948) [*R.A.M.*, 29, p. 417]. The spots on naturally infected fruits usually measure $\frac{1}{4}$ to $\frac{1}{2}$ in. in diameter and often show concentric rings of spore masses. Diseased tissues tend to be soft and watery, but the disorganization does not penetrate deeply into the flesh. Inoculation experiments showed that brushed fruits may contract infection through contact with mycelium and spores, as well as through wounds.

Lihnell (D.). **Virussjukdomar hos fruktträd och bärväxter.** [Virus diseases of fruit trees and soft fruits.]—*Sverig. pomol. Fören. Årsskr.*, 50, pp. 36–50, 7 figs., 1949. [Received July, 1950.]

Following an introductory review of the available information on virus diseases in general of fruit trees and soft fruits, a subject on which little work has so far been done in Sweden, the author describes the symptomatology of some individual viruses, concluding with some observations on control.

Apple mosaic virus [*R.A.M.*, 28, pp. 439, 578] occurs sporadically in Sweden but is of no practical importance. Two recently discovered apple diseases, 'rubbery wood' [ibid., 25, p. 121] and 'flat limb' [ibid., 24, p. 23], are present in the south, the former affecting principally the English variety Lord Lambourne but also passing to others. Infection is believed to have originated on imported trees or stocks.

The occurrence of stony pit of pear [ibid., 28, pp. 378, 631] in Sweden has not been demonstrated experimentally, but there is reason to believe that it exists in a chronic form.

Peach mosaic virus [ibid., 28, p. 563] has been observed in Scania, but is of little economic importance owing to the limited cultivation of the host.

Reversion virus of black currants [ibid., 24, p. 456] is widespread throughout the country.

Intensive studies are in progress on the viruses affecting Swedish raspberry and strawberry crops. Raspberry mosaic viruses 1 and 2 [ibid., 29, p. 315] have both been recognized, occurring as a complex in the same plant as well as singly. Notwithstanding the relatively unfavourable climatic conditions for virus spread, the disease has rapidly reduced many Lloyd George plantations from luxuriant, robust stands to a collection of stunted miniature bushes with narrow, sterile shoots. The so-called 'yellows disease' of raspberry is characterized by foliar chlorosis of two-year-old shoots starting between the veins and spreading over a large part of the leaf blade, until in extreme cases only the veins stand out as thin, green lines on a yellowish-white, sometimes nearly pure white ground. The yield of affected bushes is much below normal owing to the premature desiccation of a large proportion of the unripe berries. Marlborough is the most susceptible of the varieties grown in Sweden, with the possible exception of Superlative; Preussen, Deutschland, and Asker are seldom or never attacked. The disease is regarded as undoubtedly due to a virus distinct from the mosaic viruses 1 and 2.

The existence in Sweden of the strawberry viruses, yellow edge and crinkle [ibid., 28, p. 341; 29, p. 266], has not been demonstrated with certainty. If present at all to any extent, they are probably in a latent or very mild form without immediate practical significance.

The three main lines of approach to the control problem are (1) eradication and

destruction of all diseased plants to prevent the further spread of infection; (2) extermination of the insect vectors with the same object; and (3) exclusive use of healthy, virus-free planting material, in which connexion attention is drawn to the voluntary certification system [Strawberry Special Stocks Certification Scheme] operative in England [ibid., 29, p. 199].

Cooley (J. S.) & Groves (A. B.). **Root and collar winter injury of Apple trees.**—*Phytopathology*, 40, 4, pp. 355–362, 2 figs., 1950.

Studies on apple root rots have been pursued by the authors at intervals since 1932 in North Carolina, Virginia, West Virginia, Maryland, Indiana, New York, and Pennsylvania [*R.A.M.*, 25, p. 304]. For the present purpose, winter injury may be regarded as the effect of freezing temperatures on trees in which susceptibility has been induced by the predisposing influence of one or more contributory factors, e.g., drought, over-bearing, poor root aeration due to waterlogging, immaturity in the autumn, premature defoliation caused by leaf diseases or early autumn frosts, and breaking of dormancy followed by severe cold.

The injury ranges from a shallow lesion (the more prevalent type), affecting only the cortex, to a deep one extending through the cambium, both being usually situated $\frac{1}{2}$ to 1 in. below soil-level, though adjacent roots may be involved. The shallow lesions generally heal over completely with little or no apparent damage to the tree. The deep lesions, ranging from 2 in. in diameter to a complete girdle, may kill portions of the phloem and cambium, often irregularly, leaving in the following summer islands of living bark tissue, which are sufficiently characteristic of collar winter injury to constitute an important diagnostic feature. Another feature, especially in the early stages, is wet, loose, sloughing bark with apparently disintegrating cambium, in contrast to the tightly adherent cortex of a lesion caused by a root pathogen. Both types of lesion are mostly unilateral and the lateral extension tends to be greater than the vertical (a quarter or more of the circumference of the trunk as against 3 in. up and down).

Repeated attempts to isolate pathogenic organisms from apple collar lesions [ibid., 22, p. 30] gave negative results, and further evidence that the form of winter injury under observation is non-pathogenic is afforded by the unilateral location and irregularity of depth of the lesions, the presence of islands of live tissue in the bark (never present with the rots caused by fungi), and the nature of the healing process. In the absence of a pathogen a healing callus develops round the margin of the wound, inducing a contraction of the lesion, whereas a pathogenic injury usually continues to enlarge.

The results of the investigations herein reported indicate that collar winter injury proceeds from a complex of concomitant climatic and physical factors, which in their turn induce a physiological condition of susceptibility to the effects of cold. 'Physiocheimic injury' is suggested as a technical designation for this form of damage in place of the more general term 'winter injury'.

Barbier (G.), Quidet (P.), & Trocmé (S.). **Observations sur la carence en potasse du Pommier et du Groseillier.** [Observations on potassium deficiency of Apple and Gooseberry.]—*C.R. Acad. Agric. Fr.*, 36, 7, pp. 270–273, 1950.

In the summer of 1947 apple trees growing in the vicinity of Lyons, at Versailles, Bordeaux, Toulouse, and in Normandy developed symptoms, apparently of potassium deficiency [cf. *R.A.M.*, 27, p. 74; 28, p. 357]. At Versailles in May the whole tree appeared as if scorched. The branches stopped growing and the fruits remained small. In July and August new shoots emerged, but were small. Gooseberry bushes near the affected trees showed a similar condition and some have since died, the remainder are dying, and the apple trees are gradually succumbing.

The soil at Versailles was low in available potassium. In the winter of 1947–8, application of potassium fertilizer failed to improve the condition. The following winter an increased dosage of 120 gm. per tree and 80 gm. per bush improved the condition. On 13th May an injection of 3 l. of 0·5 per cent. potassium sulphate (7·5 gm. of potassium) was made in the trunk of one apple tree, which has since developed symptoms only tardily and slightly.

Borgström (G.). **Päronlagringens problem.** [The Pear storage problem.]—*Sverig. pomol. Fören. Årsskr.*, 50, pp. 82–104, 6 graphs, 1949. [Received July, 1950.]

Very few experiments have been performed in Sweden in connexion with the many problems incidental to pear storage. A review is given of work carried out in other countries towards the solution of these difficulties, among which are physiogenic disorders, e.g., scald [*R.A.M.*, 25, p. 122], core breakdown [ibid., 21, p. 373], and wateriness (*Bull. Calif. Agric. Exp. Sta.* 692, 45 pp., 1945), characterized by the exudation of water from the cells into the intercellular spaces and becoming increasingly prevalent with the application of hormone sprays to prevent fruit drop.

Pears are in general less susceptible than apples to [unspecified] fungal rots, perhaps in consequence of the high tannic acid content of the skin of the former. In this connexion it is further of interest to note that in many varieties the optimum temperature for ripening coincides with a slow growth rate of the organisms concerned. For instance, Kieffer ripens best at 15° C., while fungal decay is most extensive at 27°.

Hutton (K. E.). **Rust of stone fruit trees.**—*Agric. Gaz. N.S.W.*, 61, 3, pp. 135–138, 4 figs., 1950.

Rust (*Puccinia pruni-spinosae*) [*R.A.M.*, 27, p. 27] is most prevalent on stone fruit trees in New South Wales in the autumn, but it is common throughout the November–June period. Incidence is most severe on early dessert peach varieties in coastal districts and on canning peaches, plums, prunes, and nectarines. Mid- to late-season peaches in coastal and tableland districts usually show general infection only during autumn, while most of the almond and apricot varieties develop rust only in late autumn.

The control measures include removal of all diseased wood and burning or ploughing-in of prunings and infected leaves. The first spray for all stone fruits in all districts should be 15–15–100–½ Bordeaux mixture or 1–20 lime-sulphur applied at the late bud-swell to pinking stage. This should be followed in the case of early peaches in coastal districts by monthly applications of colloidal sulphur (2 lb. per 100 gals.) or wettable sulphur starting from the first week of September. For peaches and prune plums on the Murrumbidgee irrigation area 2–2–100–½ Bordeaux in mid-October, and again in mid-December should be given. Foliage sprays are not injurious in this area and should be applied as soon as possible after an irrigation. Subsequent treatments for prune plums in inland districts should be given in late October and mid-December to mid-January with wettable or colloidal sulphur (2 lb. per 100 gals.), or a mixture of either of these at half-strength with 1–160 lime-sulphur (5 pints per 100 gals.). It is tentatively recommended that plums, peaches, nectarines, and almonds in tableland and inland districts at 'shuck-fall' should be treated with one of the following foliage sprays: 1–600 lime-sulphur (5 pints per 100 gals.), the same plus wettable sulphur or colloidal sulphur at half concentration, wettable sulphur, or colloidal sulphur (2 lb. per 100 gals.). The spraying should be repeated in mid-December and if rust continues to develop a further application in late February may be necessary.

Lenander (S. E.). **Några bristsjukdomars inverkan på Körsbärsträd.** [The influence of some deficiency diseases on Cherry trees.]—*Sverig. pomol. Fören. Årsskr.*, 50, pp. 172–183, 3 figs., 1949. [English summary. Received July, 1950.]

At the Rånna Tree Experiment Station, Sweden, in the summer of 1945, two sour cherry trees of the Stora Klarbär variety, planted in 1938, were observed to be making little or no extension growth, while the young shoots bore only an apical rosette of leaves. Despite punctual and prolific flowering, the affected trees set abnormally few fruits, which long remained hard. The most conspicuous anomaly, however, observed at the onset of reddening, was the altered shape of the fruits, which were angular near the apex with sunken areas. With maturity their misshapen appearance became less noticeable, but dark brown scars could still be seen. The stalks were much shorter than those of healthy fruits. A further deterioration was apparent in 1946. In the autumn of that year borax was applied to the soil round the unhealthy trees at a dosage of 50 kg. per tree, and in the following summer there was a striking improvement in shoot growth and fruit development, which was maintained in 1948. In 1949, however, the symptoms reappeared. Being curable by borax soil amendments, they are evidently attributable to boron deficiency. The same disorder, in a milder form, was observed in the Ostheimer, Shade Morello, and Triaux varieties.

Brief descriptions are also given of the symptoms of manganese, iron, and zinc deficiencies of cherry, based on English and American investigations, and of methods for their diagnosis [*R.A.M.*, 18, pp. 36, 261; 22, p. 406; 25, pp. 98, 119, 120, 124].

Demaree (J. B.). **The virus problem in berry crops.**—*Amer. Fruit Gr.*, 70, 3, pp. 14–15, 36–40, 6 figs., 1950.

The author describes the symptoms, economic importance, distribution, and transmission of the principal viruses affecting raspberries [*R.A.M.*, 15, p. 376], blackberries, strawberries [ibid., 29, p. 266], and blueberries [*Vaccinium* spp.] in the United States, together with the reaction of various varieties to these diseases. Care should be taken to prevent their introduction to uninfected properties by removing dwarfed plants having mottled, yellowish, or misshapen leaves or bearing abnormal fruits, and by guarding against the introduction of symptomless carriers.

In general the raspberry virus situation is better than it was about 30 years ago due to the maintenance of disease-free plants with the assistance of research and extension workers and regulatory officials. The Latham variety [ibid., 18, p. 442], even though 100 per cent. infected with mosaic, may show very little evidence of infection and maintain a high berry production. The purple variety Columbia is thought to be totally infected, yet is widely grown in New York and produces good crops. The red varieties Lloyd George [ibid., 20, p. 349], Washington, Willamette, Imperial, and Pynes Royal seldom become infected with mosaic.

Curl and severe streak are seldom seen in raspberries now. Mild streak [ibid., 20, p. 26; 28, p. 465] is the most important virus disease in black raspberries in the eastern United States at present. It has been spreading for several years and some plantings have 100 per cent. infection. The berries appear normal until maturity when they are one-fourth to one-third smaller than healthy ones.

Blackberry dwarf has been reported to occur in the Pacific Coast States in the varieties Phenomenal and Logan [ibid., 28, p. 225]. Sterility is on the increase.

Strawberry virus diseases are on the increase and fruit production is on the decline. A virus disease known locally as 'multiplier plants' has been known in northern Wisconsin for many years. Infected plants are bushy, due to the formation of several adventitious buds from the main crown. Runners are scanty and they root near the old plants.

Blueberry stunt [ibid., 26, p. 113] is also spreading and taking possession of some fields. The variety Rancocas seldom shows symptoms even when exposed to heavy infection. Harding is subject to disease but sustains only slight damage. June, Dixi, and Stanley are also relatively tolerant.

Offord (H. R.). **Operation Gooseberry.**—*Amer. Forests*, 56, 1, pp. 21, 36–7, 1950. [Abs. in *For. Abstr.*, 11, 4, pp. 555–556, 1950.]

In June, 1948, a test was conducted in California of the efficacy of 2,4-D, sprayed [against *Cronartium ribicola*: *R.A.M.*, 27, p. 64; 28, p. 653] from a helicopter, in killing *Ribes* in a woodland area overrun with them. To have dug out the *Ribes* over the test area of 40 acres would have taken 160 man-days. The helicopter sprayed one acre in 30 seconds. Six weeks later 16 oz. or more of 2,4-D per acre had caused significant damage to *Ribes* and other susceptible broad-leaved plants with only minor injury to the conifers.

On steep and rocky ground, aircraft should apply sprays from two opposite directions. Five gals. per acre appeared to ensure uniform wetting. The 178 h.p. helicopter flew within 30 ft. of the ground and could spray a 30-ft. swath of *Ribes* at elevations of 5,000 to 6,000 ft. in rugged country, but it lacked the power to hover or fly slowly during spraying. When it was necessary to fly at more than 30 ft. above the ground, there was a noticeable loss of the rotor down-wash that plays an important part in driving the spray through the vegetation.

Stewart ([Miss] R. E.). **Investigations on the 'leaf spot' disease of black Mulberries caused by Septogloeum mori (Briosi and Cavara).**—*J. roy. Soc. W. Aust.*, 34, pp. 87–104, 6 figs., 1 graph, 1 map, 1950.

The fruiting body of *Septogloeum mori*, which causes leaf spot of black mulberry in Western Australia [*R.A.M.*, 26, p. 551], is a more or less circular, erumpent acervulus, many frequently coalescing into an irregular mass. The stroma, 20 μ or more thick, is of compacted dark mycelium. The erect sporophores are approximately 30 (10 to 40) μ long and olive-brown to hyaline. The 'summer' spores, which develop on living leaves and in culture, are hyaline, cylindrical, curved, with 1 to 5 (rarely 0 to 5) septa, and guttulate, borne terminally, and measure 17 to 53 by 4·5 μ. Those on dead and dying leaves and in dried-out cultures ('autumn' spores) are olive-brown to dark purplish-grey, cylindrical, elongate, torulose, with 1 to 9 septa, guttulate, and measure 20 to 70 by 5 μ.

At this stage, some hyphae are fine, hyaline, and 1 to 2 μ in diameter. In culture this type of hypha forms an aerial mass with a pinkish to mauve tint. Other hyphae are thick-walled, olive-brown, 4 to 12 μ in diameter, and of two types, one forming rather fine, paler, regular filaments 4 μ in diameter, the other more irregular with short, globular cells 8 by 10 to 12 μ. In the leaf both are incorporated in the acervulus. Colonies on potato dextrose agar were small, compact, more or less circular, pulvinate with a smooth surface (rugose on deep medium), and an entire margin. Dark hyphae in the medium were covered by a thin felt of fine, white, hyaline aerial hyphae; no spores were produced on this medium. They developed with the addition of marmite plus ammonium nitrate, and were also obtained on Conn's agar. In older cultures from a single hyaline spore a range of types from hyaline 'summer' to dark 'autumn' spores was observed.

The mycelium in the leaf first invades the spongy mesophyll intercellularly, and later particularly the parenchyma sheath of vascular bundle. About the tenth day after infection the sparse mycelium in the centre of the affected area aggregates rapidly beneath the epidermis to form the stroma and acervuli, usually on the upper surface of the leaf. This mass of tissue replaces the inner and side walls of the epidermal cells, the outer wall and cuticle remaining intact. Spores are produced in any conditions under which external moisture is present.

At 20° to 30° (optimum 25°) C. the summer spores germinated in distilled water within 24 hours; the autumn spores germinated freely after 36 hours in mulberry leaf extract. The maximum temperature for summer spores was 36°, and they were killed by 24 hours' exposure to 38°. After over-wintering in the laboratory under 1 per cent. were viable. The autumn spores survived for 36 hours at 42°.

Inoculations of mature trees in the field and of three-year-old trees in glasshouses were made by dropping suspensions of 'summer' and 'autumn' spores on the leaves. With the former typical symptoms developed in 10 to 14 days and spores were produced within 12 days. Infections were also obtained with 'autumn' spores, but, possibly owing to hot, dry weather, 20 days were required to produce spores.

In south-western areas the disease has been recorded in early summer, before fruit ripening. It has a fairly extensive distribution, mainly in the 30- to 40-in. rainfall area, where temperatures during November and December are low and humidity is high. The most northerly records are from Toodyay and Northam, both well within the 20- to 30-in. rainfall belt. This distribution suggests that infection is favoured by cool, humid conditions.

Py (C.). **L'Ananas aux Iles Hawaï.** [The Pineapple in the Hawaiian Islands.]—*Fruits d'Outre-Mer*, 5, 4, pp. 124–133, 12 figs., 1950.

In this general account of pineapple cultivation in Hawaii it is stated that the manganese content of the soil (4·43 to 9·74 per cent.) renders the iron unassimilable by the crop, which develops chlorosis due to iron deficiency [*R.A.M.*, 29, p. 161]. This condition is successfully controlled, however, by regular spraying with iron sulphate [cf. ibid., 28, p. 130], using high-pressure machines delivering a very fine spray.

Crandall (B. S.) & Baker (W. L.). **The wilt disease of American Persimmon, caused by Cephalosporium diospyri.**—*Phytopathology*, 40, 4, pp. 307–325, 2 figs., 1 map, 1950.

A remarkable feature of the wilt of American persimmon (*Diospyros virginiana*) caused by *Cephalosporium diospyri* [*R.A.M.*, 29, p. 161] is the rapidity with which it kills the trees, often in two months from the onset of infection. A scouting programme instituted soon after the discovery of the disease in Tennessee revealed its presence in seven south-eastern States, in all of which, except North Carolina, it was still persisting in 1948, while isolated cases have been found in Texas. No attempt has been made at the general control of the disease in view of its wide distribution, but experimental eradication has been carried out over limited areas. It seems probable, though actual proof is lacking, that the disease was introduced from abroad, possibly on the highly resistant Asiatic species, *D. kaki* and *D. lotus*. The Philippine *D. discolor*, the Mexican *D. rosei*, and the Indian *D. montana* seem to be immune.

Two species of beetles, *Xylobiops basilaris* and *Oncideres cingulatus*, were shown experimentally to be responsible for the great majority of wounds through which the fungus gains ingress to the trees. In the field both species were most abundant and active in making wounds on the trees when large quantities of spores were being discharged from those killed by wilt. Brownish-black streaks are formed throughout the outer annual rings of the trees, on the death of which spores are produced in abundance between the bark and wood near the base. The bark becomes separated from the wood by the spore masses and is eventually shed. In the smooth-bark portion of the tree, spores are often produced under the cortex, resulting in the formation of red blisters, and are released on the rupture of the bark through pressure.

British insecticides and fungicides for crop protection.—xxvi+124 pp., 10 col. pl., London, The Association of British Insecticide Manufacturers, 1950.

This publication contains a directory of member firms of the Association of British Insecticide Manufacturers, their products and services, a list of proprietary and trade names and marks, and coloured plates of fruit bud development stages. The introduction and the chemical names (both common and scientific) of the products, are given also in French, Spanish, German, Portuguese, and Russian.

Besemer (A. F. H.). **Nieuwe plantenziektenbestrijdingsmiddelen en hun toepassing.** [New plant disease control preparations and their application.]—*Meded. Direct. Tuinb.*, 12, 8, pp. 569–583, 1949. [English summary.]

Much of the information on new fungicides comprised in the present useful survey has already been noticed in this *Review*, but the following may be of interest. Aacoduul, a copper oxide preparation, is superior to lime-sulphur for pear scab [*Venturia pirina*] control. The concentration for pre-blossom treatments should not exceed 0·3 per cent. and for later ones is to be further reduced. Applied to apples for scab [*V. inaequalis*] control, aacoduul tends to damage the fruit. Aascu (Wiersum), similar to nosprasit [*R.A.M.*, 12, p. 31 *et passim*], should be used at a strength of 0·75 per cent. before and at 0·5 to 0·3 per cent. after the blossom.

The very costly tetramethyl thiuramdisulphide preparations include, besides pomasol [ibid., 29, p. 37], obetan, TMT Murphy, FD-dust, FD-spray, and aapirol. Their fungicidal properties are inferior to those of lime-sulphur, but they can safely be applied to sulphur-shy varieties and are particularly suitable for the two final sprays. O.B. 72, aavurol, and tulisan (0·8 per cent.) are among the best of the fungicides for tulip 'fire' [*Botrytis tulipae*: ibid., 29, p. 215] control. Also useful for this purpose is a mercurial known as AA 922.

Miller (H. J.). **Relation of concentration of some organic substances to spore germination and dosage response.**—*Phytopathology*, 40, 4, pp. 326–332, 5 graphs, 1950.

Using centrifuged suspensions of the conidia of *Sclerotinia fructicola*, *Alternaria oleracea* [*A. brassicicola*], and *Venturia inaequalis*, and the zoospores of *Phytophthora infestans*, on dried fungicide deposits on Pyralin slides [*R.A.M.*, 28, p. 471], the writer established a linear relationship of increasing concentration of orange juice, citric acid, sodium and potassium salts, and Lima bean [*Phaseolus lunatus*] extract to increased LD_{50} values of copper, nickel, and zinc compounds. Other metallic and organic fungicides evoked no such response. The necessity of standard concentrations of orange juice or citric acid and sucrose for the accurate determination of LD_{50} values is thus confirmed.

The germination of *S. fructicola* spores was little affected by variations in the concentrations of four of the test substances. Citric and malic acid reduced the germination of *V. inaequalis* at concentrations exceeding 0·008 per cent. and that of *A. brassicicola* was inhibited by these acids. The zoospores of *P. infestans* germinated best in the presence of 0·004 per cent. potassium citrate. Sodium citrate reduced germination and it was completely suppressed by malic and citric acids at concentrations above 0·005 per cent. *S. fructicola* responded favourably to rising concentrations of orange juice, which on the contrary lowered the germination of *V. inaequalis* and *P. infestans* at upwards of 0·1 per cent. Increasing concentrations of Lima bean extract markedly promoted the germination of *P. infestans*.

Zeumer (H.). **Normen für Pflanzenschutzmittel.** [Standards for plant-protectives.] —*NachrBl. dtsch. PflSchDienst.* (*Braunschw.*), 1, 8, pp. 107–112, 1949.

The recognition of commercial plant-protectives by the German Biological

Institute is dependent on their conformity to certain standards in respect of chemical composition and physical properties. These are set forth, under the headings of (1) definition, (2) requirements, (3) application, and (4) methods of testing for conformity to the standard, for various groups of fungicides and insecticides, including five types of sulphur preparations, viz., liquid colloid, wettable, barium polysulphide sprays, lime-sulphur, and dusting (vineyard) sulphur, and copper oxychloride in the form of (1) sprays with (*a*) normal copper content (15 to 18 per cent.) and (*b*) highly concentrated (45 per cent.), and (2) dusts.

Muskett (A. E.). **Presidential address. Seed-borne fungi and their significance.**—*Trans. Brit. mycol. Soc.*, 33, 1–2, pp. 1–12, 1 pl., 1950.

The author draws attention to the importance of seed-borne fungi [*R.A.M.*, 28, p. 508] and the value of their study as an aid to systematic mycology. The associations formed between seeds and micro-organisms are reviewed. It is suggested that every country should publish a list of the known contaminants of the seeds and planting stocks produced in that country, with information on their behaviour under the local climatic conditions. Provision of facilities for the adequate and rapid examination of seed samples and planting stocks and for disease surveys should be made. The ultimate end of such measures would be to secure the highest possible yields by providing ample supplies of healthy seeds and planting stocks. A number of suggestions towards this end are made.

Definitions of some terms used in plant pathology.—*Trans. Brit. mycol. Soc.*, 33, 1–2, pp. 154–160, 1950.

Definitions, prepared by the Plant Pathology Committee of the British Mycological Society, are presented of a number of terms commonly used in plant pathology for the use of plant pathologists. The list is followed by a discussion in which reference is made to the corresponding definitions published by the American Phytopathological Society [cf. *R.A.M.*, 29, p. 270].

Togashi (K.). **Biological characters of plant pathogens : temperature relations.**—478 pp., Tokyo, Meibundo Company, 1949.

The author has sought to assemble the data on the temperature relations of a large number of bacterial and fungal plant pathogens, which are arranged in alphabetical order and supplemented by an extensive bibliography and a list of synonyms. The manuscript of this valuable compilation was completed in 1935 and has been revised down to the end of 1936, mostly at the Departments of Plant Pathology of the Universities of Wisconsin and Cornell.

Buller (A. H. R.). **Researches on fungi. Volume VII. The sexual process in the Uredinales.**—xx+458 pp., 1 pl., 124 figs., Toronto, University of Toronto Press (for the Royal Society of Canada); London, Oxford University Press, 1950.

The text and figures for this volume were left, nearly ready for publication, by the author at the time of his death in 1944. The chapter headings are as follows: I, The discovery of the function of the pycnidia of the Uredinales; II, The pycnidia and proto-aecidia of the Uredinales; III, Flexuous hyphae in the Uredinales in general; IV, The union of pycnidiospores and flexuous hyphae in *Puccinia graminis* and three other rusts; V, The presence or absence of pycnidia and associated spore-forms in certain Uredinales; VI, Methods of initiating the sexual process in the rust fungi; VII, Comparison of the sexual processes in the Uredinales with those in the Hymenomycetes; VIII, A review of cytological work on the sexual process in

heterothallic Uredinales; IX, *Cronartium ribicola* and its sexual process; X, *Puccinia suaveolens* and its sexual process; XI, The genus *Gymnosporangium*; XII, The geological time during which the pycnidia of the Uredinales attained their present form and function, with some remarks on the evolution of other entomophilous fungi. As with Buller's previous volumes, students will find much to interest and stimulate them.

The book was prepared for Press by Dr. G. R. Bisby and is preceded by a foreword by the President of the Royal Society of Canada, a portrait, and editorial notes, including a list of chapters on various mycological subjects left in typescript by Buller and now filed at the library of the Royal Botanic Gardens, Kew.

Bewley (W. F.). **Commercial glasshouse crops.**—xii+509 pp., 64 pl., 2 figs., 5 diags., 3 graphs, London, Country Life Ltd., 1950. 50*s*.

This valuable and profusely illustrated treatise, based on thirty years' experience at the Experimental and Research Station, Cheshunt, is intended primarily for the commercial glasshouse grower, but will prove useful for the industry as a whole. It includes chapters on planning and building a nursery, the soil, the tomato, cucurbits and vegetable crops, fruit crops, cut flowers, bulbs, pot plants, vegetables in the open, disease and pest control (pp. 417–466), a historical survey of the glasshouse industry, and recent applications of science to glasshouse crops. The various aspects of disease and pest control are discussed at reasonable length. A detailed account of the organisms which attack glasshouse plants is to be dealt with in another volume.

Hagedoorn (A. L.). **Plant breeding.**—237 pp., 4 pl., 3 figs., 6 diags., 2 graphs, London, Crosby Lockwood & Son, Ltd., 1950. 12*s*. 6*d*.

This is neither a text-book on genetics nor an exhaustive treatise of everything pertaining to plant breeding. It is intended primarily as a popular work in plain language for those who are actively engaged in the amelioration of cultivated plants or in the development of plant novelties. The book is divided into three parts, I on more theoretical subjects, which is devoted largely to genetics, II on more practical subjects, being concerned with type of material dealt with and methods of handling it, and III on methods of breeding and selection in some special groups. Chapter VIII (pp. 54–59) deals briefly with virus and virus resistance, chapter XVII (pp. 100–105) with disease resistance, and chapter L with microorganisms, and there are various references to plant pathological subjects in the other chapters. A general index is provided together with literature recommended.

Garcés (O. C.). **Naturaleza de la resistencia a la enfermedad en las plantas.** [Nature of resistance to disease in plants.]—*Rev. Fac. Agron. Medellín*, 10, 36, pp. 334–358, 1949.

This is a summary and discussion of some noteworthy contributions to the subject of the various types of resistance to disease in plants [cf. *R.A.M.*, 23, p. 139; 27, p. 575, *et passim*].

Chester (K. S.). **Plant disease losses: their appraisal and interpretation.**—*Plant Dis. Reptr, Suppl.* 193, pp. 190–362, 8 figs., 22 graphs, 1950. [Multilithed.]

In this outstanding publication the author makes a fundamental analysis, principally from the literature, of the importance, principles, problems, and techniques of plant disease appraisal [cf. *R.A.M.*, 29, p. 222]. The twelve chapters deal, respectively, with the value of accurate information on plant disease losses, defects in present plant disease appraisal practices, some principles and problems of plant disease appraisal, techniques for determining plant disease intensity, methods of

plant disease surveying, organized plant disease surveys, statistical, historical, and experimental methods for determining disease intensity—loss relationships (chapters VIII and IX), and the analysis and summation of these, forecasting outbreaks and losses, and economic aspects of plant disease losses. Future possibilities are briefly discussed in a postscript and there is a bibliography of 16 pages. Mention of some of the points dealt with will indicate the scope of the work. They include, among many others, disease appraisal as a research tool, determination of the economics and value of plant disease control measures, determination of the probable success or failure of new agricultural ventures, the economic value of plant disease forecasts, reasons for inaccurate estimates, desiderata of appraisal methods, the study and recording of the tempo of plant disease development, plant disease intensity maps, United States, Canadian, British, Danish, German, and Russian plant disease survey methods, comparison of yields of resistant and susceptible crop varieties and of a susceptible variety with and without protection, effects of fungicides on crops apart from disease control, statistical significance in disease loss appraisal studies, correlation between disease intensity and yields, the types of loss caused by plant diseases, the economic classification of plant diseases, the concept of a 'normal' crop, cumulative effect of soil-, seed-, and tuber-borne diseases, and the effect of plant diseases on the use and value of land and on the consumer and society.

Niethammer (Anneliese). **Technische Mykologie. Hefen und Schimmelpilze.** [Technical mycology. Yeasts and moulds.]—268 pp., 26 figs., Stuttgart, Ferdinand Enke, 1947. [Abs. in *Biol. Abstr.*, 24, 4, p. 985, 1950.]

This is an introductory mycological text-book and work of reference for students and industrial employees working with fungi. Pages 1–91 deal with the physiology of fungi. The remainder of the book is a systematic account of the industrially noteworthy yeasts and eumycetous moulds, reference being made to their uses or importance in industry but with the emphasis primarily on their morphology.

Hutchinson (S. A.). **The use of plastics for mounting the larger fungi.**—*Trans. Brit. mycol. Soc.*, 33, 1–2, pp. 43–44, 1950.

A method of making permanent mounts of larger fungi in methyl methacrylate (Kallodoc) is described. First the stabilizer must be removed by distillation or the method indicated by the suppliers and the monomer dried, filtered, and stored at 4° C. If complete impregnation is desired, the specimen must be dehydrated with alcohol, but many can be embedded successfully without complete dehydration; they are washed with 95 per cent. alcohol under reduced pressure and transferred directly to the monomer. Polymerization can be accelerated by several methods, but the rate must be kept uniform throughout the medium and slow in the later stages. A convenient method of solidification is to heat monomer containing a catalyst (0·1 per cent. benzoyl peroxide) at 85° to 95° C. under an air condenser until it becomes a thick syrup, shaking constantly. The syrup is cooled to 35° and poured over the fungus, previously suspended in or impregnated with liquid monomer, which should then be held at 35° to 40° for about 18 to 24 hours until solid. A water-bath is necessary to control temperature during final solidification. If glass containers are used for embedding the glass must be broken; the solid block is then shaped, smoothed, and polished.

Ark (P. A.) & Dickey (R. S.). **A modification of the van Tieghem cell for purification of contaminated fungus cultures.**—*Phytopathology*, 40, 4, pp. 389–390, 1 fig., 1950.

In the writers' modification of Raper's method for the freeing of fungal cultures from bacterial contamination [*R.A.M.*, 16, p. 626], two or three plastic modelling

clay pellets, 2 to 3 mm. in diameter, are substituted for glass beads for raising the micro slide ring or van Tieghem ring above the bottom of the Petri dish. The clay is not changed by heating and has proved non-toxic to various fungi.

Ellis (M. B.). **A modification of the 'necol' technique for mounting microfungi.**—*Trans. Brit. mycol. Soc.*, 33, 1–2, p. 22, 1950.

A modification of the 'necol' (cellulose acetate) technique for making mounts of microfungi in which mycelium and fructifications are borne on the surface of the substratum has proved of value in recent studies of *Clasterosporium caricinum* and other hyphomycetes. The 'necol' film with the fungus embedded in it is placed on a glass slide and acetone is pipetted on to it. The film dissolves and spreads out in a ring, leaving the fungus behind. This ring is wiped off and repeated gentle washing with acetone clears away almost all the necol. The preparation is then mounted in lactic acid or lactophenol.

Rhodes (Mabel). **Preservation of yeasts and fungi by desiccation.**—*Trans. Brit. mycol. Soc.*, 33, 1–2, pp. 35–39, 4 figs., 1950.

Cultures of fungi and yeasts intended for preservation by drying at the National Collection of Type Cultures, Elstree, were grown on a solid medium. Non-sporing organisms were dried as soon as good growth developed, and sporing genera when spores were produced. A loopful of culture or a small piece of mycelium, where possible with spores, was macerated in a loopful of sterile horse serum on the inner wall of a plugged sterile test-tube. This tube was placed in a wider one, at the bottom of which was a little phosphorus pentoxide. The drawn-out end of the outer tube was attached to a pump, and when the vacuum was satisfactory, sealed off at the constriction. Dried cultures were stored at room temperature in the dark. To recover the organisms about 1 ml. of liquid medium was pipetted into the small tube, which was then incubated. On revival some genera spored better than cultures from the same organisms maintained on the usual media.

Nearly 88 per cent. of the 405 cultures of 61 genera survived for periods up to 13 years, and it appears that if a culture survives drying by this method it will remain viable indefinitely.

Goldie Smith (E. K[athleen]). **Note on a method of inducing sporangium formation in Pythium undulatum Petersen, and in species of Saprolegnia.**—*Trans. Brit. mycol. Soc.*, 33, 1–2, pp. 92–93, 1950.

During a study at Royal Holloway College of *Pythium undulatum* [*R.A.M.*, 26, p. 132] from leaves of water-lilies sporangia formation was promoted by the following method, which always proved reliable at 16° to 24° C. A thin plate of rich nutrient agar, such as maize meal, is inoculated inside a glass ring [see preceding page]. When good growth has developed outside the ring, halved hemp seeds, sterilized by boiling, are placed cut surface down on the margin of the mycelium for 10 to 20 hours. The half seeds are then transferred to a Petri dish (not more than three per dish) containing sufficient sterile distilled water barely to cover them. After 15 to 20 hours, large, ellipsoid sporangia have developed and actively discharge their zoospores. Development and discharge of sporangia lasts many hours and is prolonged by changing the water several times during the day.

For species of *Saprolegnia* a vigorous crop of active sporangia can be obtained three or four days after the seeds have been transferred to water. Zoospore discharge at a particular time can be relied on if the water is changed several times during the first two days and the cultures then left undisturbed until the fourth day. Discharge is then induced by changing the water $\frac{1}{2}$ to 1 hour before the cultures are required.

Walton (R. B.) & Woodruff (H. B.). **A crystalline antifungal agent, mycosubtilin, isolated from subtilin broth.**—*J. clin. Invest.*, 28, 5, pp. 924–926, 1949.

At the Research Laboratories of Merck & Co., Rahway, New Jersey, a fungistatic substance has been isolated in crystalline form from cultures of *Bacillus subtilis* and named mycosubtilin. The antibiotic completely inhibited the growth, e.g., of *Fusarium moniliforme* [*Gibberella moniliformis*], *Nematospora coryli* [*R.A.M.*, 27, p. 361], and *Penicillium notatum* at 7·5 μ gm. per ml., *Chaetomium bostrychodes* [ibid., 28, p. 298] at 5, *Sclerotinia fructicola* [ibid., 29, pp. 371, 373] at 2·5, and *Ustilago zeae* [*U. maydis*] at 1·5.

Dunshee (B. R.), Leben (C.), Keitt (G. W.), & Strong (F. M.). **The isolation and properties of antimycin A.**—*J. Amer. chem. Soc.*, 71, 7, pp. 2436–2437, 1 graph, 1949.

At the Wisconsin Agricultural Experiment Station an optically active, nitrogenous phenol, designated antimycin A [*R.A.M.*, 28, p. 635], was isolated from cultures of an unidentified species of *Streptomyces*. It is a highly potent antibiotic, exerting a fungicidal effect on *Nigrospora sphaerica*, for instance, at a dilution of 1 in 800,000,000.

Rennerfelt (E.). **The effect of some antibiotic substances on the germination of the conidia of Polyporus annosus Fr.**—*Acta chem. scand.*, 3, 106, pp. 1343–1349, 1949.

A tabulated survey is given of the author's experiments at the Forest Research Institute, Stockholm, on the action of more than 20 antibiotics on the germination of the spores of *Polyporus* [*Fomes*] *annosus*, the agent of spruce root rot in Swedish forests, which is responsible for annual losses of several million kronor [*R.A.M.*, 29, p. 448]. In the south of the country the fungus is also destructive to the Scots pine (*Pinus sylvestris*). Among the substances tested at pH 3·6, gladiolic acid, gliotoxin [ibid., 28, p. 469], glutinosin [ibid., 27, p. 145], the red pigment from *Penicillium janczewskii* [ibid., 28, p. 475], mycophenolic acid, puberulic acid, and viridin [ibid., 27, p. 23] were totally fungistatic at concentrations of 10, 5, 5, 5, 1, 10, and 5 p.p.m., respectively. Unlike the majority of the antibiotics, viridin [ibid., 29, p. 322] was more effective at pH 5 than at 3·6 (0·2 p.p.m.) and glutinosin and the *P. janczewskii* pigment equally so. The pine heartwood extract pinosylvin and its monomethyl ether also inhibited germination at 50 p.p.m.

Thaysen (A. C.). **Antibiotics in the soil.**—*Nature, Lond.*, 166, 4211, pp. 93–94, 1950.

The author emphasizes the need for the study of antibiotic-producing microorganisms in soils and natural habitats and the conditions under which their activity is favoured [cf. *R.A.M.*, 29, p. 373]. Antibiotic action is restricted to a certain space, and the prevailing chemical and physical conditions may affect it considerably. Certain natural microbial associations are now being studied at the Colonial Microbiological Research Institute, Trinidad [ibid., 28, p. 475], and it is becoming apparent that not only is the ability to produce antibiotics dependent on available nutrients but also on some obscure biological heritage which may suddenly be lost.

Appling (J. W.), Buckman (S. J.), & Cash (C. D.). **Determination of the mould resistance of paper and paperboard.**—*Tappi* (Tech. Ass. Pulp Pap. Ind.), 32, 9, pp. 427–429, 1 fig., 1949.

The Bulab method, developed at the Buckman Laboratories, Inc., Memphis, Tennessee, for the determination of mould resistance in paper and paperboard

[cf. *R.A.M.*, 29, p. 325] is described. It involves the use in each test of at least two of the following organisms: *Chaetomium globosum*, *Penicillium* sp. (isolate 66, Lever Brothers), *Aspergillus versicolor*, and *A. niger*. The evaluation of resistance is based on visual inspection of the samples after 14 days' contact with pure cultures of the moulds on a malt agar–mineral salts medium at 28° C.

Mouldproofing treatment and mould resistance test for leathers for use in tropical conditions.—British Leather Manufacturers' Research Association, Egham, Surrey, 8 pp., 5 figs., 1950.

This is a revised edition of methods recommended in 1945 [*R.A.M.*, 24, p. 332] for proofing leathers against mould and for testing the proofing. The recommended fungicides in order of preference now include paranitrophenol [ibid., 28, p. 583], pentachlorophenol (or its sodium salt), parachlorometacresol and parachlorometaxylenol, β-naphthol, cresylic acid (of which antigallic has been the most popular variety), and sodium trichlorophenate.

These products are described and notes given on the time of application and treatment of different leathers. The value of a given treatment can now be assessed in three weeks if the leather to be tested is first soaked in water and then inoculated with spores from a piece of mouldy leather. The second apparatus previously described is no longer used.

Tropic proofing.—iii+32 pp., London, H.M. Stationery Office, 1949. 9*d*.

This booklet, compiled by the Directorate of Chemical Research Development, Ministry of Supply, is an up-to-date version of the wartime pamphlet, written at the suggestion of the Department of Scientific and Industrial Research, and intended mainly for the use of civilian exporters to tropical countries. The 11 chapters deal, respectively, with fungal and insect attack, plastics and rubber, leather and wood, textiles and cordage, paper and packaging materials, organic finishes: paints and varnishes, lubricants and temporary metal protectives, optical instruments, and electrical equipment. A list of six publications on similar topics is appended.

Under the heading laboratory methods of testing (pp. 3–6) a description is given of tests on (1) materials and certain components, and (2) large equipment and packages. For (1) samples are inoculated with spores of the moulds most common in the tropics (*Aspergillus niger*, *A. amstelodami* of the *A. glaucus* group, *Paecilomyces varioti*, *Penicillium brevi-compactum*, *Stachybotrys atra*, and *Chaetomium globosum* [*R.A.M.*, 27, p. 438]) and incubated at 30° C. Samples which show no traces of growth after four weeks' incubation may be considered mould-proof. This method is designed to produce the greatest possible mould growth in the shortest time. For (2) tropical changes of temperature and humidity are simulated. Inoculated test pieces are incubated for 12 hours at about 30° C. and 95 to 100 per cent. relative humidity; during the following 12 hours the temperature is decreased to about 20° C. and the relative humidity after reaching saturation point falls slightly owing to air leaks. The equipment is then sprayed with a spore suspension and the test continued as in (1).

Mossel (D. A. A.) & Westerdijk (Johanna). **The physiology of microbial spoilage in goods.**—*Antonie van Leeuwenhoek J. Microbiol. Serol.*, 15, pp. 190–202, 1 graph, 1949.

The authors emphasize the need for studying microbiological food spoilage in the actual substratum and using the exact conditions under which spoilage takes place. Internal and external factors effect a selection in the development of micro-organisms present on a substratum and only a limited number of these take part

in the spoiling process. The specific microflora associated with any one food spoilage is termed the association of a food [*R.A.M.*, 29, p. 371]. The development of the association will depend intrinsically on the chemical composition of the substratum. Processing of vegetables or meat changes the natural microflora. Extrinsically atmospheric humidity, temperature, oxygen, and sunlight are important. Rate of growth under optimal conditions will influence the association and it depends on synergistic and antagonistic relationships of microorganisms.

The authors give a table of parameters governing the development of the most important spoilage organisms compiled from data from the literature, to which there are 75 references.

Morse (R. E.), Fellers (C. R.), & Levine (A. S.). **The toxicity of certain organic acids to yeast and mold in the presence of fruit juice-syrup mixtures.**—*J. Milk Food Tech.*, 11, 6, pp. 346–351, 1948.

In comparative experiments at the Massachusetts Agricultural Experiment Station acetic was found to be the most effective acid in the prevention of growth by *Saccharomyces cerevisiae* and *Aspergillus niger* [*R.A.M.*, 20, p. 74], inhibiting the former at 0·33 and the latter at 0·19 per cent. To obtain comparable effects with citric and lactic acids against the yeast it was necessary to use 6·29 and 5·72 per cent. concentrations, respectively, and while the lethal dose of lactic acid for the mould was 5·72 per cent. it was not controlled by citric acid even at 7·75 per cent. Neither organism developed in the presence of 0·1 per cent. sodium benzoate.

Stahl (Marianne). **Die Mycorrhiza der Lebermoose mit besonderer Berücksichtigung der thallosen Formen.** [The mycorrhiza of the liverworts with special reference to the thallose forms.]—*Planta*, 37, 1, pp. 103–148, 27 figs., 1949.

A full account is given of the author's exhaustive studies at the Botanical Institute of the University of Würzburg, Germany, on the mycorrhiza of liverworts, which fell into four main types, viz., thamniscophagous, thamniscophysalidophagous, tolypophagous, and haplohaustorial.

Harley (J. L.). **Recent progress in the study of endotrophic mycorrhiza.**—*New Phytol.*, 49, 2, pp. 213–247, 1950.

With frequent reference to the literature the author reviews critically the progress since 1927 [*R.A.M.*, 6, p. 743] in the study of endotrophic mycorrhiza [ibid., 28, p. 76], with regard to (1) the vesicular-arbuscular type of mycorrhiza [ibid., 29, p. 224] and (2) mycorrhiza in the Ericaceae, Pyrolaceae, Cistaceae, and Orchidaceae [ibid., 29, p. 423]. He also emphasizes outstanding problems requiring further research on the subject from a study of work in other fields. Some examples of endotrophic mycorrhiza are tabulated to illustrate the variability of this type of phenomenon. A four-page bibliography of references is appended.

Reid (W. W.). **Pectic enzymes of the fungus Byssochlamys fulva.**—*Nature, Lond.*, 166, 4210, pp. 72–73, 1950.

An examination of two cultures of *Byssochlamys fulva* [*R.A.M.*, 27, p. 247; 29, p. 317] in the Research Department of H. W. Carter and Co., Ltd., Coleford, Gloucestershire, showed that both produced exocellular pectic enzymes, one culture being very active. Concentrated preparations reduced the viscosity of 1 per cent. pectin solutions in a matter of minutes. The fungus was shown to elaborate both pectin-esterase and polygalacturonase.

Brian (P. W.) & Hemming (H. G.). **Some nutritional conditions affecting spore production by Trichoderma viride Pers. ex Fries.**—*Trans. Brit. mycol. Soc.*, 33, 1–2, pp. 132–141, 1950.

A study was made at the Butterwick Research Laboratories, Welwyn, of the effect of different nutrient combinations on conidial production by five strains of *Trichoderma viride* [*R.A.M.*, 18, p. 761; 25, p. 75; 26, p. 23]. In general, a medium of initial pH 4 to 6 was best. Most strains sporulated most vigorously in media in the middle of the range 0·1 to 10 per cent. glucose, though one preferred the highest value. Variation in nitrogen concentration (as ammonium tartrate or sodium nitrate) had more significance than variation in magnesium sulphate or potassium phosphate, sporulation tending to be most vigorous on media with the lower nitrogen levels; in media with high nitrogen a high magnesium sulphate level favoured sporulation. In most strains sporulation was stimulated by the addition of calcium chloride (0·01 to 0·1 per cent.), whereas lithium chloride stimulated sporulation of only one strain. Iron was essential for optimum growth and sporulation, and copper for the development of the green colour of the spores; zinc decreased sporulation in two strains. Conditions which favoured mycelial growth reduced the number of spores formed per unit weight of mycelium, though they might increase the number of spores per culture. Much evidence was obtained of interaction between the nutritional factors.

Fernow (K. M.) & Garcés (O. C.). **Producción de semilla certificada de Papa.** [Production of certified Potato seed.]—*Rev. Fac. Agron. Medellín*, 10, 36, pp. 257–295, 17 figs., 1949.

This useful survey of potato diseases and pests in Colombia has been prepared for the benefit of growers engaged in certified seed production [*R.A.M.*, 28, p. 415]. It comprises, *inter alia*, some general recommendations as to field inspections, observations on diseases and pests of the crop and a programme for their control, and keys for their identification.

The following are encountered in Colombia. Leaf roll was observed to an appreciable extent in only five out of 100 fields inspected, and in no case did the incidence exceed 10 per cent. Rugose mosaic (virus Y) is destructive and fairly prevalent, especially in the so-called 'native' varieties. The losses due to mild mosaic (virus A) do not amount to more than 20 per cent. or so. Investigations are in progress to ascertain the position in respect of latent mosaic (virus X) in the country with a view to the production of X-free seed.

Veinal chlorosis, apparently introduced from Ecuador, is very widespread in the Department of Narino and in certain districts of Antioquia. It produces a brilliant yellow coloration of the foliage, discernible at a distance of 100 m., or in mild cases merely a chlorosis of the smaller veins near the margin. The diseased plants are usually of normal size, and no reliable information is to hand regarding the mode of transmission of the virus or its effect on yield. In some heavily infected fields (50 to 75 per cent.) in Antioquia production did not appear to be lowered. Another disease inducing a bright yellow coloration of the foliage is calico [? a strain of lucerne mosaic virus: ibid., 19, p. 563 *et passim*], but it differs from the foregoing in the following respects: the extent of the chlorosis is generally less, mild infections are not limited to the veins, and the maximum incidence hitherto encountered is 2 to 3 per cent. The small, circular, well-defined, yellow lesions caused by aucuba mosaic virus, which is believed to occur in Colombia in very small amounts, are usually confined to the basal region of the plant.

Since the vectors of potato yellow dwarf virus and aster yellows virus in the United States [ibid., 23, p. 490; 25, p. 335] have not been recognized in Colombia, another leafhopper of the same type is probably implicated in the latter country.

Among microbial infections, those due to *Pseudomonas* [*Xanthomonas*] *solanacearum* and *Fusarium* sp. are of special interest in the present connexion as controllable by seed certification. Other diseases observed in the country include blight (*Phytophthora infestans*) [ibid., 28, p. 415], early blight (*Alternaria solani*), rust (*Puccinia pittieriana*) [ibid., 18, p. 12], stem canker and black scurf (*Rhizoctonia* [*Corticium*] *solani*), powdery scab (*Spongospora subterranea*) [ibid., 28, p. 415], and black leg (*Erwinia phytophthora*) [C.M.I. map No. 131]. Besides the foregoing, two diseases have only recently been identified in the Colombian potato crops. A species of *Rosellinia* is responsible for a condition externally indistinguishable from bacterial wilt. However, when the plant is free from the surrounding soil, the stem base, the mother tuber, and the newly formed tubers are all found to be covered with a dense network of yellowish-white hyphae, which penetrate the flesh and appear like black thorns in the interior. There is no actual decay, but the affected tubers present a glossy aspect and finally lose water, becoming shrivelled, very light, and hard. The pathogen, which has been destructive in Antioquia and Caldas, may be carried in stable manure or transmitted through the seed. Tubers attacked by smut (*Thecaphora solani*) [ibid., 24, p. 70] bear small, superficial tumours or warts, and scattered through the entire flesh are numerous brown or black spots, which may occasionally coalesce to form extensive zones of discoloration.

Zabala (S.). **Clasificación de los virus de la Papa.** [Classification of the Potato viruses.]—*Publ. misc. Minist. Agric., B. Aires*, Ser. A, 6, 50, 14 pp., 1950.

This is a Spanish translation of the section relating to the classification of potato viruses in the sixth edition of Bergey's 'Manual of Determinative Bacteriology' [*R.A.M.*, 29, p. 197].

Andreae (W. A.) & Thompson (Kathleen L.). **Effect of leaf roll virus on the amino-acid composition of Potato tubers.**—*Nature, Lond.*, 166, 4210, pp. 72–73, 1950.

In experiments carried out in the Department of Biology, University of New Brunswick, chromatograms of 28 healthy Green Mountain potato tubers and 28 infected with leaf roll revealed a striking and consistent difference in the occurrence of tryptophane and tyrosine. In healthy tubers both amino acids were found in appreciable amounts while in diseased tubers no tryptophane and very little tyrosine was observed. These results were obtained with both aqueous and alcoholic extracts. If this difference in the content of these amino acids proves specific for leaf roll infection, it may become the basis of a long sought-for, simple chemical test for the diagnosis of this disease in potato tubers.

Ross (A. F.). **Unrelatedness of Potato virus Y and Cucumber mosaic virus.**—*Phytopathology*, 40, 5, pp. 445–452, 2 figs., 1950.

A tabulated account is given of cross-protection tests at Cornell University, Ithaca, New York, the results of which showed that potato virus Y and cucumber mosaic virus, contrary to Chester's supposition [*R.A.M.*, 14, p. 782], are not nearly related [ibid., 18, p. 337; 23, p. 403; 28, p. 237]. The infection of *Physalis floridana* plants by cucumber mosaic virus did not prevent the formation of lesions on subsequent inoculation with potato virus Y. At 80° F., however, the symptoms of infection by the latter virus on *P. floridana* were very mild. The inoculation of such plants with Price's indicator strain of cucumber mosaic virus [ibid., 14, p. 5] resulted in the development of lesions comparable to those produced on plants that were healthy at the time of inoculation. The concentration of potato virus Y in *P. floridana*, Turkish tobacco, and *Nicotiana glutinosa* was found to be higher in plants grown at 80° than in those maintained at 70°.

Hooker (W. J.). **A technique for observing tuber enlargement and scab development in Potatoes.**—*Phytopathology*, 40, 4, pp. 390–391, 1 diag., 1950.

A technique for the daily observation of potato tuber enlargement and the development of scab (*Streptomyces* [*Actinomyces*] *scabies*) has been devised at the Iowa Agricultural Experiment Station [*R.A.M.*, 28, pp. 117, 539]. Sprouted seed pieces were grown from treated tubers planted at least 4 in. deep in quartz sand. An 8-in. plant pot with a 3-in. circular hole in the side about 3 in. from the bottom was inverted on a 10-in. clay saucer, with peat moss packed round the joint, and sterile quartz sand added to within 1 in. of the lower edge of the lateral hole. A seed piece with the best sprout only retained was inserted through the lateral hole and partially buried in the sand, the tip of the sprout emerging through the drainage hole. A layer of moss tied over the surface of the pot and plugged in the lateral hole was sprayed twice daily with an atomizer to maintain moisture. Once a week the large plug was removed and an excess of modified Hoagland's solution [ibid., 21, p. 61] poured over the surface of the sand. The air temperature within the pot was 18° to 20° C. Tuber development was normal, with no hypertrophied lenticels and very little seed piece decay. Yields approximated to those generally obtained in soil culture under comparable greenhouse conditions. Developing tubers were sprayed with a spore and mycelial suspension of the pathogen, and periodical measurements of tuber diameter and scab lesion size made. The inoculations were successful and resulted in apparently normal lesions.

Hey (A.). **Die Biotypenforschung beim Erreger des Kartoffelkrebses, Synchytrium endobioticum (Schilb.) Perc., in Deutschland.** [Biotype research on the agent of Potato wart, *Synchytrium endobioticum* (Schilb.) Perc., in Germany.]—*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 2, 1–2, pp. 1–3, 1948. [Received June, 1950.]

An account is given of the existing and proposed measures for the elimination of the destructive new biotypes of potato wart (*Synchytrium endobioticum*) in Germany [*R.A.M.*, 28, p. 192] by the cultivation of the resistant Fram and other selections.

Müller (K. O.). **Hypersensitivity and tumour development in Potato tubers in response to infections with Phytophthora infestans.**—*Nature, Lond.*, 166, 4214, pp. 231–232, 1 fig., 1950.

In experiments at the National Institute of Agricultural Botany, Cambridge, the cut surfaces of tubers of some F_2 progeny of a certain cross between a *W* variety and a common variety of potato, developed tumours when inoculated with a dilute zoospore suspension of a parabiontic strain of *Phytophthora infestans* [*R.A.M.*, 28, p. 414]. When incubated for four to five days at about 20° C., the growths contained no wound periderm-like tissues, and the fungus fructified sparingly on the tissues. Tubers of the same genotype differed in their capacity to react in the manner described. Such a reaction has not been observed on hyposensitive [author's correction] (susceptible) genotypes.

Grainger (J.). **Forecasting outbreaks of Potato blight in west Scotland.**—*Trans. Brit. mycol. Soc.*, 33, 1–2, pp. 82–91, 7 graphs, 1950.

From 1944 to 1948 forecasts of the first appearance of potato blight (*Phytophthora infestans*) on disease phenology plots at the West of Scotland Agricultural College, based on Beaumont's temperature-humidity rule [*R.A.M.*, 27, p. 88], were all valid when the requisite conditions of temperature and humidity occurred after the last days of June, but not before. In the former case the interval before foliage blight appears is from 10 to 16 days. There was no evidence of correlation between the amount of foliage blight and yield although loss in total yield from foliage blight in years when the disease develops early may attain 25 per cent. of the possible crop. Forecasts would be useful for protective spraying to reduce spread

to the tubers, experiments having shown that such spraying could reduce infection in the tubers by 15 per cent. It should, however, be applied in conjunction with destructive spraying whenever possible. Reliable forecasts of the first appearance of blight would also be valuable in timing destructive sprays for early seed crops of Epicure potatoes in parts of Ayrshire.

Perkins (Barbara L.) & Starr (G. H.). **The prevalence and distribution of Corynebacterium sepedonicum in Potato plants.**—Abs. in *J. Colo.-Wyo. Acad. Sci.*, 4, 1, p. 50, 1949.

At the University of Wyoming Bliss Triumph potato tubers were inoculated as follows with suspensions of *Corynebacterium sepedonicum* [*R.A.M.*, 29, p. 328]: full strength (7 gm. exudate from infected tubers per 250 c.c. distilled water) and diluted 1 in 10, 1 in 100, 1 in 1,000, 1 in 10,000, and 1 in 100,000. Seed pieces were planted in field plots, and on the first appearance of ring rot symptoms (6th August) three to six hills in each series were pulled and used to make bacterial smears. Subsequent collections were made on 18th and 25th August and 10th and 20th September. Bacteria were relatively more abundant as the season advanced, generally in proportion to the amount of inoculum used. Comparatively few organisms occurred in the 1 in 10,000 and 1 in 100,000 series, and no ring rot symptoms developed in the plants inoculated with dilutions beyond 1 in 1,000. Conversely, some healthy plants were found in the 1 in 10 series. Bacteria were irregularly distributed in the branches and stems, though infection tended to be heavier at the base than at the tip of the plant. Practically all stems from pieces treated with the full-strength inoculum were infected in the late-season collections, whereas in the 1 in 100,000 only one-third of the stems harboured any bacteria.

Baldacci (E.). **Chiavi analitiche delle principali malattie del Riso in Italia.** [Analytical keys to the principal diseases of Rice in Italy.]—*Notiz. Malatt. Piante, 1950*, 8, pp. 38–45, 1950. [Mimeographed.]

Following a key to the principal diseases of rice found in Italy, arranged under the organs affected, these diseases are described under their popular Italian names, with notes on the causes, symptoms, development, type of locality where found, injuriousness, and control. Mention may be made of the following.

'Brusone' disease (*Piricularia oryzae* and *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: *R.A.M.*, 28, p. 486; see also ibid., 29, p. 117]) occurs wherever rice is grown, often reaching epidemic proportions and entailing heavy losses. The physiological form [loc. cit.] is also found and causes losses of 20 to 50 per cent. or more. Sclerotial disease (*Leptosphaeria salvinii*) [ibid., 19, p. 301; 28, pp. 238, 355] is widespread but not usually severe. Infection by *Sclerospora oryzae* [ibid., 13, p. 804] is endemic. Rust, attributed to *Puccinia graminis* f. *oryzae* [ibid., 23, p. 455], appears to be fairly common. False smut (*Ustilaginoidea virens*) [ibid., 27, p. 125; 28, p. 355] occurs in 'subtropical' areas, causing limited damage.

Other diseases found include leaf spots due to *Ascochyta oryzae*, *Septoria oryzae*, *S. poae*, *Sphaerella Mycosphaerella oryzae*, *Metasphaeria cattanei*, *M. oryzae*, *Sphaeropsis oryzae*, *S. vaginarum*, *Sporotrichum angulatum*, [*Asterophora angulata*], and *Coniothyrium oryzae*, stem lesions by *Fusarium reticulatum* [ibid., 24, p. 400], and glume and inflorescence infection by *Chaetophoma oryzae*, *Epicoccum neglectum* [ibid., 28, p. 595], and *Periconia pulla* (recorded once).

Warcup (J. H.). **The soil-plate method for isolation of fungi from soil.**—*Nature, Lond.*, 166, 4211, pp. 117–118, 1950.

In this soil-plating technique used at the Botany School, Cambridge, about 0·005 to 0·015 gm. of soil are transferred to a sterile Petri dish and 8 to 10 ml. of

cooled Czapek-Dox plus 0·5 per cent. yeast extract agar medium (adjusted to pH 4) added. The soil particles are dispersed either by shaking in the case of sandy soils or first mixing the particles with a drop of sterile water in the plate for a clay soil or if the soil is very dry. A higher number of species was obtained from the soil plate method and from plates made from the residue after the preparation of the soil suspension than from the suspension itself.

Genera such as *Pythium*, *Mortierella*, and many of the darker-coloured Hyphomycetes not usually recorded from soil [cf. *R.A.M.*, 29, pp. 330, 432] were isolated by the soil plate method. *Dictyostelium mucoroides* [ibid., 27, p. 154], common Basidiomycetes, and Myxomycete plasmodia have also been detected.

KILLIAN (C.) & MOUSSU (Mlle H.). **Les sols des environs d'Alger : caractères physico-chimiques et floristiques, tests biologiques et microbiologiques.** [The soils in the neighbourhood of Algiers: physico-chemical and floristic characters, biological and microbiological tests.]—*Rev. gén. Bot.*, 57, 677, pp. 389–428, 3 figs., 4 graphs, 1950.

In a study of the physical and chemical properties of six degraded soil types from near Algiers it was ascertained that the weight and nitrogen content of the mycelium of *Aspergillus niger* [*R.A.M.*, 29, p. 171] cultured on them gave a fair indication of their nutritive value. The method used was to inoculate a standard nutrient solution with a determined volume of the spores of the fungus and add this to a given weight of soil. Deficiency in nutrients limited the growth of the fungus. Measured quantities of phosphates and potassium were then added to the soil samples and the weight of mycelium obtained was determined. Mycelial weight was very low in calcareous soils.

MCGEORGE (W. T.). **Lime-induced chlorosis : relation between active iron and citric and oxalic acids.**—*Soil Sci.*, 68, 5, pp. 381–390, 3 figs., 1949.

Lime-induced chlorosis affects both orchard and field crops on calcareous soils in Arizona, where the chlorotic pattern is predominantly of the iron-deficiency type. At the State Agricultural Experiment Station green and chlorotic leaves of the following field and orchard crops were analysed to determine whether a correlation exists between citric and oxalic acids and active iron in lime-induced chlorosis: Sudan grass, sorghum (hegari), soy-bean, groundnut, cotton, grapefruit, Valencia orange, lemon [*R.A.M.*, 26, pp. 197, 241], peach, and apple. In the field crops the amount of active iron was less in the chlorotic than in the green foliage. A higher citric acid content was present in the chlorotic than in the healthy leaves of soy-bean (24·2 and 3·2 mgm. per gm., respectively) and groundnut (17·1 and 8·1), but citric acid was low in both the healthy and chlorotic samples of sorghum and Sudan grass. Oxalic acid was low in all the samples and bore no significant relation to foliar condition. In the case of citrus and deciduous fruits a marked correlation was demonstrated between active iron and citric and oxalic acids, the chlorotic leaves containing more citric acid and less of the other two constituents than the green samples. These observations apply to the zinc- as well as to the iron-deficiency type of citrus chlorosis [ibid., 25, p. 559]. In one lot of peach leaf samples, the contents of citric and oxalic acids (mgm. per gm.) and active iron (per cent.) were as follows: green 11·8, 69·7, and 0·011, respectively; chlorotic 22·2, 49·8, and 0·009; and green (from a branch plugged with iron citrate) 8·1, 61·6, and 0·014. The corresponding figures for apple samples of the three types were 13, 49·5, and 0·011; 23·1, 32·7, and 0·009; and 11·2, 50·5, and 0·024.

Pot experiments were carried out to study the effect of acidifying soil amendments (sulphur and sulphur-manure) on the citric acid content of white and blue lupins, of which the former is the more tolerant of soil conditions responsible for

lime-induced chlorosis [ibid., 28, p. 525]. In one test, on highly calcareous Mesa soil, the amounts of citric acid present in the tops of white lupins were not appreciably reduced by the treatments. In the blue lupin, on the other hand, there were significant reductions. On slightly calcareous Marana soil the citric acid content of the white lupins was substantially reduced by the amendments and that of the blue considerably more so. The percentage of active iron was correspondingly increased by the treatments, and comparable effects were obtained in plots of sorghum receiving a sulphur-manure side dressing, as well as in the citrus leaves injected with iron citrate. The total iron content of blue lupin roots was higher than that of the white, indicating lower mobility in the former and offering a possible explanation of its greater susceptibility to chlorosis. The absorption of manganese, zinc, and copper was also increased by the treatments, the excess of the two first-named, in fact, being harmful to the plants.

Burges (A.). **The downward movement of fungal spores in sandy soil.**—*Trans. Brit. mycol. Soc.*, 33, 1–2, pp. 142–147, 1 fig., 4 graphs, 1950.

In an investigation of soil fungi from the Breckland, East Anglia, it appeared that some showed distinct vertical zonation. Three fungi with representative distributions, *Penicillium cyclopium*, confined mainly to the upper few cm., *Zygorrhynchus vuillemini* mainly below 10 cm., and *Gliomastix convoluta* present in all layers, were therefore selected to ascertain the extent to which the spores would wash through the soil.

A hollow frame 55 cm. tall was constructed of four glass plates, a plug of sterilized cotton wool was fixed in the lower end, and the column filled with sifted, sterilized sand from the area examined. About 200 to 300 ml. of sterile water was allowed to flow through it to pack the particles down and the excess drained off. About 2 ml. of spore suspension were slowly poured on to the top of the column, followed by 100 ml. of sterile water. After the excess water had drained off the column was placed horizontally, the front plate removed, weighed samples taken from the centre at various depths, and dilution plates made. The column was immediately refilled and a further 2 ml. of the spore suspension poured on, after which 200 ml. of washing water were used. In the third experiment 600 ml. of washing water were used.

The results showed that the spores of *Z. vuillemini* and *G. convoluta*, both of which have a mucilaginous wall, were washed readily through the sand column, whereas those of *P. cyclopium*, which are dry, showed very little downward movement.

Ramakrishnan (T. S.). **The occurrence of Pythium vexans de Bary in South India.**—*Indian Phytopathology*, 2, 1, pp. 27–30, 1949. [Received June, 1950.]

Pythium vexans [*R.A.M.*, 28, p. 591] was recently found on several new hosts in South India, growing at elevations of over 3,000 ft. It was isolated from diseased ginger rhizomes at Wynaad, Malabar, on which the aerial shoots were yellow and wilted and rhizomes were rotten. The symptoms are similar to those caused by *P. aphanidermatum* and *P. myriotylum* [ibid., 20, p. 290], which occur at lower altitudes. Besides causing damage in the field, 50 to 90 per cent. of stored seed rhizomes are destroyed if untreated [ibid., 20, p. 150].

Cardamom rhizomes in plantations in the Tinnevelly, Madura, and Coimbatore districts and in Travancore are commonly affected by a disease known among the planters as 'clump rot', due to *P. aphanidermatum* and more often to *P. vexans* (also isolated at over 3,000 ft.). Manurial treatments with ammonium phosphate and superphosphate at about 2 oz. per clump have kept the disease in check.

In recent years a species of *Pelargonium* has been cultivated for oil extraction at

Yercaud, Shevroy hills. During 1946, after heavy rainfall, an epiphytotic of stem rot occurred in the plantations. Dark brown, water-soaked lesions appeared on the stems and branches and many of the shoots wilted and died. The roots of some of the cuttings were also rotten, resulting in the collapse of the shoots. Isolations from infected tissues yielded *P. vexans*.

In 1948 *P. vexans* caused considerable losses in cinchona plantations on the Anamalais (3,500 to 4,500 ft.), both in nurseries and to one- to three-year-old plants in the field. The incidence was highest in badly drained areas, but was reduced by regular applications of Bordeaux mixture.

At the Pomological Station, Conoor, Nilgiris, apple grafts on crab apple wilted suddenly and died in July, 1947. The roots were in different stages of rotting. *P. vexans*, *Rhizoctonia* [*Corticium*] *solani*, and a species of *Fusarium* were isolated from the diseased plants.

Thompson (F. C.), Cripps (E. G.), & Burgess (A. H.). **Experiments on magnesium deficiency in the Hop plant. Progress Report I.**—*Rep. Dep. Hop Res., Wye College, 1949*, pp. 34–42, 1950.

It has been found that magnesium deficiency in hops [*R.A.M.*, 12, p. 785], not previously reported in the field, can occur [in south-east England] on neutral or alkaline soil where the level of available magnesium is moderately high. Under these conditions the governing factor appears to be the level of available potassium. The deficiency has been controlled in hop gardens by applying magnesium sulphate (Epsom salts) to the soil and omitting potash fertilizers.

The dominant symptom of potassium-induced magnesium deficiency on alkaline soil is a chlorosis of the leaf, leaf scorch being generally absent. On acid soils a severe marginal and interveinal scorch develops and can appear relatively early in the season.

Thompson (F. C.), Cripps (E. G.), & Burgess (A. H.). **The effect of soil acidity on growth of Hops. Some observations on manganese toxicity and induced iron deficiency.**—*Rep. Dep. Hop Res., Wye College, 1949*, pp. 43–47, 1950.

In studies on the effect of soil acidity on the growth of hops it was found that the manganese content tends to increase markedly from May to June in established hops, followed by the development of leaf chlorosis and scorch in July. Iron falls appreciably from May to June in young replants, coinciding with the development of iron deficiency symptoms in the chlorotic plants. A marked response to iron injection was obtained on the same site. As the season progressed the young replants were found to be recovering from the iron deficiency while established hops were beginning to show symptoms of chlorosis and scorch in the following stages; (*a*) an interveinal yellowing, resembling that described for magnesium deficiency in hops [see preceding abstract], and a clearly defined marginal chlorosis, (*b*) the development of interveinal necrosis and marginal scorch in the chlorotic areas, the rest of the leaf remaining green, and (*c*) a yellow leaf with a dark brown clear-cut marginal and interveinal scorch. Towards the end of the season most of the young plants had recovered from the iron deficiency. The above symptoms may be due to a complex of magnesium and calcium deficiency and manganese toxicity.

From these observations it is evident that manganese toxicity is one factor affecting the growth of hops on certain acid soils on the High Weald of Kent. In some cases the manganese uptake may be so high that an induced iron deficiency develops as the result of ion antagonism. In the hop, symptoms of chlorosis and scorch have been observed at manganese contents ranging from 300 to 600 p.p.m., but induced iron deficiency has only been found at a manganese content of well above 1,000 p.p.m. A symptom associated with high leaf manganese, but not with other known nutritional disorders so far, is a pale leaf with necrotic speckling

between the veins in spots which tend to coalesce and form a blotchy scorch. The speckling has been noted particularly on young plants; on established hops irregular dead areas occur on the leaf.

Prasada (R.) & Chothia (H.). **Studies on Safflower rust in India.**—*Phytopathology*, 40, 4, pp. 363–367, 1950.

Puccinia carthami has been observed on safflower near Delhi, India [*R.A.M.*, 28, p. 161], in February and March and on the wild species, *Carthamus oxyacantha*, in January. The rust was found to be morphologically and pathologically identical on both hosts, and cross-inoculations gave positive results.

The uredospores germinate well at a temperature range of 8° to 30°, with an optimum at 18° to 20°. In dry storage at 8° to 10° they remain viable for over a year, whereas those kept in the laboratory in April lose their viability in three weeks. When infected plants are exposed to a temperature of 30° to 31° the uredospores retain their viability for three weeks, as compared with only three days at 52° to 55°.

The incubation period extends over 10 to 14 days according to the prevailing temperature. Above 40° the rust tends to form teleutosori directly, the production of uredospores being omitted. Cultures cannot be maintained in Delhi during May and the uredospores are unable to persist through the summer.

The teleutospores are formed in April. Some germinate shortly afterwards, while others require a five- to six-month resting period. A temperature of 12° to 18° is conducive to germination. Cross-inoculations with teleutospores result in the development of pycnia and uredosori in 10 to 14 days. Resting teleutospores remain viable during the summer and may either infect safflower directly or attack *C. oxyacantha* first.

Crandall (B. S.). **Leaf diseases of Peruvian Barbasco, Lonchocarpus utilis.**—*Phytopathology*, 40, 1, pp. 34–43, 4 figs., 1950.

Three diseases affecting new and recently matured leaves of barbasco (*Lonchocarpus utilis*), a South American rotenone-producing leguminous plant, are reported from Peru. A rust caused by *Dicheirinia archeri*, originally described by Cummins from Surinam [*R.A.M.*, 16, p. 410], is widespread in the region of Iquitos and between Tingo María and Pucallpa. Target spot (*Pellicularia filamentosa*) [*Corticium solani*: ibid., 22, p. 372; 29, p. 382] and a leaf wilt (*Cephalosporium deformans* n.sp.) are known only from the latter area. So far the resultant damage has not been generally severe.

Comparing the cultural characters of the *Rhizoctonia* states of the isolates of *P. filamentosa* from *L. utilis* and other local hosts with those of *Corticium solani* [ibid., 29, p. 382], the author points out two differences. In the first place, the tendency to zonation in the former is almost absent from the latter, and secondly the growth of *P. filamentosa* is much slower than that of *C. solani* (5 to 10 as against 20 mm. per 24 hours).

Cephalosporium deformans is characterized in malt agar cultures by a pinkish-white, sparse, somewhat granular, tufted mycelium; hyaline, simple, continuous conidiophores, 1·7 to 2·5 μ in width at the base, tapering slightly towards the apex, 11·9 to 75 μ in length, mostly arising at right angles to the hyphae; and continuous, elliptical, hyaline conidia (salmon-coloured to red in the mass), 8·5 to 17 by 5·1 to 6·8 μ (mostly 11·9 by 5·1) in nature, slightly smaller in culture, produced acrogenously and forming globose heads, 37·5 μ in diameter.

The original minute, slightly chlorotic spots expand between the veins to a diameter of 1 to 2 mm. and acquire a surrounding pinkish to lavender halo. They then cease to develop and become necrotic, and spore production occurs on the under side of the leaf. However, the much more typical site of the lesions is near

the midrib or a vein. Inoculation experiments with spore suspensions were successful on young leaves only, the symptoms developing in seven days.

MEFFERT (MARIA E.). **Zur Geschichte der Helminthosporiose des Oelmohns.** [On the history of the helminthosporiosis of the Opium Poppy.]—*NachrBl. dtsch. PflSchDienst, Berl.*, N.F., 3, 5–6, pp. 104–106, 1 fig., 1949.

Up-to-date information on the symptomatology of helminthosporiosis of opium poppy and the taxonomy of the causal organism, *Pleospora calvescens* [*R.A.M.*, 29, p. 433], is summarized from 19 contributions to the relevant literature, an amplified version being due for publication shortly in *Phytopath. Z.*

WILES (D. R. D.). **Plant diseases and Cotton.**—*Rep. Dep. Sci. Agric. Barbados, 1948–1949*, pp. 72–73, [? 1950].

In the section of this report [cf. *R.A.M.*, 28, p. 488] dealing with sugar-cane mosaic [virus] disease it is stated that during the year under review, in accordance with the Mosaic Disease (Eradication) Act, 1943, 237 returns were received showing the presence of 37 infected holes in scattered areas in the parishes of Christ Church, St Philip, St Andrew, St Thomas, and St Peter, Barbados. All the infected holes were destroyed. The reduction in numbers is ascribed to the increased acreages planted with B. 37161 [ibid., 29, pp. 121, 383].

LE BEAU (F. J.). **Pathogenicity studies with Colletotrichum from different hosts on Sorghum and Sugar Cane.**—*Phytopathology*, 40, 5, pp. 430–438, 2 figs., 1950.

At the United States Department of Agriculture Sugar Plant Investigations, Meridian, Mississippi, the author studied the pathogenicity to sugar-cane and sorghum of 593 isolates of *Colletotrichum* from 18 grass species, of which 563 were collected on sugar-cane, sorghum, Johnson grass [*Sorghum halepense*], Sudan grass, broomcorn [*S. bicolor* var. *technicus*], and *Erianthus*. Pathogenicity was judged by the capacity of the isolates to induce red rot in cut sugar-cane and sorghum stalks and leaf spot in sorghum following leaf whorl inoculations. The two methods yielded comparable results.

Three species of *Colletotrichum* have been described as occurring on different grasses, namely, *C. falcatum* [*Physalospora tucumanensis*], the agent of red rot of sugar-cane, *C. lineola*, and *C. cereale*, of which the two last-named were referred by G. W. Wilson (*Phytopathology*, 4, pp. 106–112, 1914) to a single species, *C. graminicola*. In these experiments the isolates fell into three groups on the basis of pathogenicity to sorghum and sugar-cane. Cultures isolated from sugar-cane formed a group which caused severe damage to the same host but rarely attacked sorghum, while those originating on sorghum, *S. halepense*, Sudan grass, *S. bicolor* var. *technicus*, and *Erianthus* were non-pathogenic to sugar-cane but mostly highly pathogenic to sorghum. Neither sorghum nor sugar-cane sustained any material damage from a third group of 28 isolates from 13 other grasses.

LANJOUW (J.). **Botanical nomenclature and taxonomy. A symposium organized by the International Union of Biological Sciences with support of UNESCO at Utrecht, the Netherlands, June 14–19, 1948.**—*Chron. bot.*, 12, 1–2, pp. 1–88, 1 pl., 1950. (The Chronica Botanica Co., Waltham, Mass.; Wm. Dawson & Sons Ltd., London, W.C. 2. $2.50.)

This symposium, edited by Professor J. Lanjouw, contains the minutes of the Utrecht Conference of 1948, together with a supplement to the International Rules embodying the alterations made at the Sixth International Botanical Congress, Amsterdam, 1935, compiled by T. A. Sprague. A supplement by J. Lanjouw discusses the need for an international society of plant taxonomists.

Wehmeyer (L. E.). **The fungi of New Brunswick, Nova Scotia, and Prince Edward Island.**—vii+150 pp., National Research Council of Canada, 1950.

Dr. J. H. Craigie contributes a preface to this critically annotated list of fungi collected in the Maritime Provinces of Canada, the second in the series of Memoirs of Canadian Fungi, of which the first was 'The Fungi of Manitoba and Saskatchewan' [*R.A.M.*, 18, p. 414]. The total number of species (including varieties) in the Maritime Provinces is estimated at 2,043 as compared with 2,749 in Manitoba and Saskatchewan, with 956 common to both areas. A bibliography of 68 titles and host and fungus indexes are provided.

Croxall (H. E.). **Studies on British Pyrenomycetes. III. The British species of the genus Diatrypella Cesati & De Notaris.**—*Trans. Brit. mycol. Soc.*, 33, 1–2, pp. 45–72, 5 figs., 3 graphs, 1950.

In this study of herbarium material and cultures of the British species of *Diatrypella* listed by Massee (*Grevillea*, 15, p. 68, 1887), viz., *D. verruciformis*, *D. nigro-annulata*, *D. tocciaeana*, *D. aspera*, *D. favacea*, and *D. quercina*, the author shows that only *D. favacea* (which includes the first four species named) and *D. quercina* can be maintained as valid. Bisby and Mason's list of British Pyrenomycetes [*R.A.M.*, 20, p. 35] contains in addition *D. discoidea*, *D. exigua*, and *D. rhois*, but the author was unable to study these. The development in culture of the conidia of the British species of *Diatrypella* is described in detail with measurements.

Johansen (Gudrun). **The Danish species of the Discomycete Genus Pezicula.**—*Dansk bot. Ark.*, 13, 3, 26 pp., 8 figs., 1949.

This is a critically annotated list of eight species of *Pezicula* occurring in Denmark, namely, *P. livida* (*Myxosporium abietinum*) [*R.A.M.*, 10, p. 633] on various conifers; *P. stipitata* n.sp., with asci measuring 129·3 by 25·8 and ascospores 37·6 by 12·3 μ, on *Acer pseudoplatanus*; *P. rostrupii* n.sp. (stat. conid. *M. rostrupii* Ferd. & Jørg. [ibid., 18, p. 717], which the author renames *Cryptosporiopsis rostrupii* (Ferd. & Jørg.) n.comb.) with asci measuring 159 by 22·5 μ, ascospores 37·3 by 10·8 μ, and conidia 36·4 by 12·3 μ; *P. cinnamomea* (*C. grisea*) on oak, *Corylus avellana*, and alder; *P. carpinea* on hornbeam; *P. frangulae* on *Frangula alnus*; *P. crataegi* (*M. corticola*) on apple [ibid., 27, p. 241]; and *P. pruinosa* var. *pruni* n.var., with asci measuring 122·3 by 18 μ, ascospores 20·6 by 8·5 μ, and conidia 19·1 by 7·5 μ, on cherry. The descriptions of *P. livida*, *P. stipitata*, *P. cinnamomea*, *P. carpinea*, and *P. frangulae* are based on herbarium material.

Evidence of homothallism in *P. crataegi* was afforded by the development of apothecia on sterile apple branches in glass tubes inoculated with a monoascospore culture. Apple fruits inoculated in November, 1940, with monoascospore cultures of *P. crataegi* were quite rotten by the middle of January, 1941. Apples inoculated at the same time with *P. pruinosa* var. *pruni* showed red-brown, rotten patches, 5·5 cm. in diameter, two months later. The results of further tests at the end of November, 1940, on one- and two-year-old *Prunus* and apple branches were negative for *Prunus*, while the latter developed yellow- to red-brown wounds with a brown to violet outer ring, measuring 16 by 10 to 39 by 19 mm. on 20th May, 1941.

Most of the species of *Pezicula* mentioned above appear to be parasitic in the conidial state but saprophytic in the ascigerous, the symptoms generally being those of a bark canker. Occasionally the fungi can do considerable damage.

Loos (C. A.). **Calonectria theae n.sp.—the perfect stage of Cercosporella theae Petch.**—*Trans. Brit. mycol. Soc.*, 33, 1–2, pp. 13–18, 2 figs., 1950.

The sporophores of a fungus closely resembling *Cercosporella theae* having been observed on *Crotalaria anagyroides* suffering from collar rot and bearing red peri-

thecia of a species of *Calonectria* in Ceylon [*R.A.M.*, 27, p. 297], a comparative study was made of ascospore cultures of the *Calonectria* and conidial cultures of *Cercosporella theae* from tea. Both fungi developed conidiophores consisting of an erect main axis from one side of which arose branches or metulae at irregular intervals. At the apex of each metula was a whorl of banana-shaped phialides measuring 13 to 15·5 by 2·9 to 3 μ with long, multiseptate spores. That these conidial states are not those of a *Cercosporella* is demonstrated by the sterile main axis with a terminal swollen head projecting above the bundles of lateral, penicillate, conidia-bearing branches. They agree with those of *Candelospora*. The conidia of the tea fungus had a mean of 76·6 by 5·2 μ, those of the *Crotalaria* fungus 79 by 6 μ. The red perithecia of both were superficial, separate, and globose, embedded in a weft of orange-coloured mycelium. The wall was rough with projecting cells except round the elevated ostiole. On quaker oats agar they were approximately the same size, 0·34 to 0·44 mm. in diameter. The ascospores were hyaline, elongate-fusoid, uni- to tri-septate, and markedly constricted in the outer wall at the middle septum. Those from *Crotalaria* measured (means) from 42 by 5 μ on sterile tea leaf to 57 by 6 μ on sterile tea stems, the corresponding figures for the tea fungus being 53 by 7 μ to 65 by 7 μ.

The fungus from *Crotalaria* differs from the tea fungus in that the termination of the sporophore axis is globose, not cylindro-clavate; the perithecia are red rather than orange-red; the ascospores are smaller; and it is pathogenic to *Crotalaria anagyroides* as well as to tea. The author, however, regards both as strains or varieties of the same species. He proposes the name *Calonectria theae* n.sp. for the perfect state of the tea fungus, and *C. theae* var. *crotalariae* n.var. for the other.

Ahmad (S.). **A contribution to the fungous flora of Pakistan and India.**—*Indian Phytopathology*, 2, 1, pp. 11–16, 6 figs., 1949. [Received June, 1950.]

An annotated list is presented of 21 species of fungi collected in Pakistan [cf. *R.A.M.*, 29, p. 333] and India. Included are *Myrothecium roridum*, *Memnoniella echinata*, and *Periconia pycnospora*.

Thirumalachar (M. J.) & Mundkur (B. B.). **Genera of rusts I.**—*Indian Phytopathology*, 2, 1, pp. 65–101, 36 figs., 1949. [Received June, 1950.]

In this series of papers the authors plan to bring together most of the available information on the genera of Uredinales. They invite the co-operation, suggestions, and critical comments of mycologists and plant pathologists. Type material and representatives of several genera in the Arthur Herbarium and many other herbaria in the United States and in the Royal Botanic Gardens, Kew, and numerous specimens sent by collectors have been examined. The first paper contains an annotated list of 40 rust genera (in alphabetical order) each with a generic diagnosis, type species, distribution, and bibliography.

La Touche (C. J.). **On a thermophile species of Chaetomium.**—*Trans. Brit. mycol. Soc.*, 33, 1–2, pp. 94–104, 4 pl., 9 figs., 1950.

A full account is given of the author's study of a thermophile Ascomycete producing perithecia resembling those of a *Chaetomium* [*R.A.M.*, 29, p. 323]. For this new fungus, which developed on fermenting wheat straw in an incubator at 40° to 50° C., the author proposes the name *C. thermophile* n.sp. While a full, critical discussion of the diagnostic features must await the examination of numerous strains, it is pointed out that the cylindrical asci of this species are a rare feature in *Chaetomium*.

Gadd (C. H.) & Loos (C. A.). **Further observations on the spore growth of Exobasidium vexans.**—*Trans. Brit. mycol. Soc.*, 33, 1–2, pp. 19–21, 1950.

Further studies on *Exobasidium vexans* [*R.A.M.*, 29, pp. 57, 58, 337] showed that

when the germ-tubes have grown a short distance the tips enlarge into spherical, dark bodies 4·3 to 5·6 μ in diameter, and each spore may form one to five appressoria, depending on the number of germ-tubes produced. When the appressorium is fully developed, much of the germ-tube is empty. A film of mucilage fixes germ-tube and appressorium to the surface. The rate at which appressoria form largely depends on external conditions; on tea leaves they have been found in eight hours. Spores germinate well and form appressoria on leaves of other plants. Appressoria form in distilled water on glass, thickness of the water film being the main factor in their production. A fine thread penetrates the cuticle and cell wall, branching almost entirely intercellularly, though short, irregularly shaped haustoria penetrate the cells. Each blister on a leaf results from a separate infection. The hymenial surface matures two or three weeks after infection.

Schweizer (J.). **De situatie inzake de blisterblight-ziekte van de Thee op Sumatra's Oostkust.** [The situation in respect of the blister blight disease of Tea on the east coast of Sumatra.]—*Bergcultures*, 19, 10, pp. 207, 209, 211, 1950.

Between 27th March and 2nd April, 1950, the writer, accompanied by [J.] Reitsma, [J. H.] van Emden, and other specialists, visited a number of tea gardens along the east coast of Sumatra to obtain up-to-date information on the blister blight (*Exobasidium*) [*vexans*] situation [*R.A.M.*, 29, pp. 58, 386]. Owing to labour shortage and other difficulties, it will not be practicable in all cases to apply the necessary cultural measures for the control of the disease until next year. The first $2\frac{1}{2}$ months of the current year were drier than usual, with a beneficial effect on the health of the crop. The conclusion reached in the middle of 1949 as to the decisive influence of the microclimate on the development of the pathogen was fully confirmed during the latter part of the year. In this connexion the adverse effects of undue density of shade and thickness of ground cover are emphasized. Both should be so adjusted as to restrain the depredations of the pathogen within reasonable limits. A crop reduction of 25 to 30 per cent. has been postulated for estates at high elevations where a rational mode of cultivation is practised. In lower-lying gardens the shade problem is less acute, but here, too, moderation should be exercised.

Direct control is still in an experimental stage. Copper-containing fungicides have been found the most effective, and the development of sprayed bushes is much superior to that of untreated. The value of spraying is regarded as indisputable, and it now remains to decide on the type of apparatus to be used (the following are available for testing: The Portamist, Farquhar, Wervelwind [Whirlwind], Huysmans, and pressure-retaining knapsack sprayers), and the period and frequency of the treatments.

One aspect of the indirect control programme is concerned with the choice of shade trees, and experiments are planned with *Albizzia falcata*, *Erythrina*, *Gliricidia*, *Leucaena*, and *Grevillea*. A suitable ground cover must also be sought, e.g., *Vigna* or possibly *Parea*. Pruning and plucking operations should be carried out on the lines recommended in the relevant literature, the former preferably with the approach of the dry season [ibid., 27, p. 298], while the pruning surface should be maintained as level as possible. An important step in the right direction is the introduction of 'slope pruning' and 'slope plucking'. A matter of extreme urgency is the search for and development of resistance with a view to the multiplication of suitable clones as replacements for those lost through blister blight.

González Bautista (L. A.). **Enfermedades del Tabaco.** [Tobacco diseases.]—*Agric. venez.*, 13, 133, pp. 20–22, 4 figs., 1950.

Popular notes are given on the occurrence and control in Venezuela of the tobacco

diseases caused by *Nicotiana* virus 1 [tobacco-mosaic virus: *R.A.M.*, 29, p. 479], *Thielaviopsis basicola*, *Cercospora nicotianae* [loc. cit.], the agents of damping-off (*Pythium debaryanum*, *Phytophthora* [*parasitica* var.] *nicotianae* [loc. cit.], and *Rhizoctonia* [*Corticium*] *solani*), and *Bacterium* [*Pseudomonas*] *tabacum*.

Wilkins (M. H. F.), Stokes (A. R.), Seeds (W. E.), & Oster (G.). **Tobacco mosaic virus crystals and three-dimensional microscopic vision.**—*Nature, Lond.*, 166, 4212, pp. 127–129, 4 figs., 1950.

From crystal structure analyses at King's College and the Royal Institution, London, it appears very likely that the crystals present in tobacco plants infected by tobacco mosaic virus [*R.A.M.*, 29, p. 279] are pure virus protein. The crystals were seen to be composed of flat layers about 3,000 to 6,000 Å thick and the width of the bands observed was equal to the length of the virus particle. In early stages of infection (about one week), the crystals are thick hexagonal plates composed of only a few layers and growth takes place in the direction of the hexagonal axis, the number of layers increasing. The prism edges of the crystal are helical because of the presumably helical arrangement of the virus particles.

The characteristic feature of the virus to aggregate in a number of ways may be seen when a fragment of leaf is left for a few hours in distilled water. In this study the length of the virus particle could not be established with certainty from crystals with helical structure. A second, much rarer type of crystal, which was found in the plant, had the same properties as those observed in purified material composed of particles 2,800 Å long. It is suggested that they are crystals of pure virus and it is almost proved that these crystals in the plant are composed of the 2,800 Å rod particles.

New observations on the optical properties of the purified virus protein are reported.

Fulton (R. W.). **Variants of the Tobacco necrosis virus in Wisconsin.**—*Phytopathology*, 40, 3, pp. 298–305, 2 figs., 1950.

In field and greenhouse studies at Madison, Wisconsin, in co-operation with the United States Department of Agriculture, a virus found in about 10 per cent. of the roots of apparently healthy greenhouse-grown tobacco (Havana Seed No. 38) and guar (*Cyamopsis tetragonaloba*) plants produced on the leaves of several plants symptoms closely resembling those of the tobacco necrosis virus. The same virus was found causing a severe necrotic disease of field-grown tulips [*R.A.M.*, 28, p. 290] during 1948 and 1949. Leaves of the infected plants bore many elongated, light-coloured, necrotic areas with dark margins, and were stunted and twisted. In a few cases there were dark, necrotic streaks on the petals from which the virus was recovered. The disease occurred on less than 0·1 per cent. of the tulips observed. Since roots of tobacco plants remained uninfected when grown in steamed soil-compost in the greenhouse it was concluded that the infection had originated in the compost used and had not been introduced from an outside source.

Hosts not previously reported as being susceptible to the virus [ibid., 19, p. 668] are groundnut, *Brassica oleracea* var. *capitata*, watermelon, melon, squash, guar, barley, clover (*Trifolium pratense*, *T. repens*), and maize.

By repeated transfer of single lesions on cowpea leaves, six isolates were obtained which differed consistently in the type of symptoms produced on cowpea and tobacco leaves. Differences in the thermal inactivation points of five isolates appeared consistent and ranged from 86° to 96° C. The sixth isolate (designated as strain D) was so unstable in tobacco leaf extracts that very little activity was detected after 1 hour. The six isolates are believed to represent strains of the tobacco necrosis virus.

Gäumann (E.) & Naef-Roth (Stephi). **L'influence de la température sur le degré de toxicité des toxines phytopathogènes.** [The influence of temperature on the degree of toxicity of phytopathogenic toxins.]—*C.R. Acad. Sci., Paris*, 230, 3, pp. 258–260, 1 graph, 1950.

Young tomato shoots 15 cm. long were placed in an $n/5 \times 10^3$ solution of lycomarasmin (*Fusarium bulbigenum* var. *lycopersici* toxin) [*R.A.M.*, 28, p. 27] until they had absorbed (in 40 to 100 minutes) the minimum toxic dose of 150 mg. lycomarasmin per kg. of the living plant. They were then placed in water and maintained at 10° to 30° C. and 50 to 60 per cent. relative humidity. After 48 hours the average degree of wilting shown (as estimated according to an arbitrary scale of 0, no effect, to 4, strong necrosis) was found to rise steadily with increasing temperature, being approximately 0·5 at 12°, 2 at 18·5°, and 3·5 at 30°. This increase in toxicity with temperature was demonstrated to be due to activation of the transformation of the lycomarasmin into a lycomarasmin-iron complex ten times more toxic.

Wilhelm (S.). **Vertical distribution of Verticillium albo-atrum in soils.**—*Phytopathology*, 40, 4, pp. 368–376, 1 graph, 1950.

Some of the results of this study at the University of California, Berkeley, on the vertical distribution of *Verticillium albo-atrum* in a variety of soil samples have already been presented in a preliminary note [*R.A.M.*, 29, p. 281]. Experiments were designed to relate the infection index of the soils, arbitrarily interpreted as the percentage of Bonny Best tomato plants contracting infection by *V. albo-atrum* when planted, ten per pot, in a unit volume of soil (four 8-in. pots for each 6-in. depth), to the inoculum potential, i.e., the total inoculum present in the unit volume of soil. By adding specific quantities of inoculum to untreated mountain soil and to soil fumigated with chloropicrin (0·5 ml. per gal.) both before and after planting with tomatoes, the infection index was found to be directly related, within broad limits, to the inoculum potential, and to be at any rate a function of the inoculum potential and distribution, and of the past crop history of the land. *V. albo-atrum* is able to persist for several years in some parts of California cropped continuously with non-susceptible crops.

Frazier (W. A.), Dennett (R. K.), Hendrix (J. W.), Poole (C. F.), & Gilbert (J. C.). **Seven new Tomatoes—varieties resistant to spotted wilt, Fusarium wilt, and gray leaf spot.**—*Bull. Hawaii agric. Exp. Sta.* 103, 22 pp., 16 figs., 1950.

Breeding experiments carried out in Hawaii for several years have produced the varieties Oahu, Lanai (3549), Hawaii, Maui, Molokai, Kauai, and Niihau resistant to *Fusarium* wilt [*F. bulbigenum* var. *lycopersici*: *R.A.M.*, 26, p. 534; 29, pp. 84, 87], spotted wilt [ibid., 28, p. 550], and grey leaf spot [*Stemphylium solani*: ibid., 29, p. 388]. Details of the parentage and characters of the varieties are given. Their resistance to *Fusarium* wilt is believed to be as good as that of Pan America, with the possible exception of Oahu and Maui. Resistance to spotted wilt is apparently equal to that of Pearl Harbor. Resistance to grey leaf spot is excellent. Small quantities of seed are available at the Experiment Station and the Agricultural Extension Service, University of Hawaii.

Glasscock (H. H.) & Dermott (W.). **Tomato root injury due to Cheshunt compound.**—*J. hort. Sci.*, 25, 3, pp. 151–154, 1 pl., 1950.

As the roots of tomato plants grown in soil treated, sometimes indiscriminately, with Cheshunt compound against *Phytophthora* root rots [*P. cryptogea* and *P. parasitica*: *R.A.M.*, 1, p. 373; 29, p. 199] frequently show dead and discoloured

tissues, an experiment was carried out at the Wye Sub-Centre of the N[ational] A[gricultural] A[dvisory] S[ervice], Kent, in 1947, which demonstrated that eight applications (250 ml.) of Cheshunt compound solution in 30 days instead of water, caused root damage to tomato seedlings and checked their growth, while further applications aggravated these effects. In 1948 the experiment was repeated in a modified form, and it was ascertained that when Cheshunt compound was applied from the time of seeding, seedling development was markedly inhibited in 12 days. Potting was followed by a brief recovery, but within eight days development again became checked, and 34 days after potting serious stunting and marked root damage had occurred. In the 1948 experiment, where damage occurred, the loam component of the compost was slightly alkaline (pH 7·1), though in a parallel experiment where acid loam (pH 5·1) was used, root damage and growth inhibition were negligible. Emphasis is laid on the fact that the authors' account of root damage to tomato plants following the use of Cheshunt compound refers only to applications which were excessive in number or in the strength of the solution used.

Report on forest research for the year ending March, 1949.—80 pp., 1 pl., London, H.M. Stationery Office, 1950.

In the section of this report [cf. *R.A.M.*, **27**, p. 591] dealing with pathology (pp. 12–18) T. R. Peace states that a sclerotia-producing species of *Botrytis* was very prevalent in England during the period under review on nursery plants of *Cupressus macrocarpa* and *Chamaecyparis lawsoniana*, Sitka spruce [*Picea sitchensis*], and Douglas fir [*Pseudotsuga taxifolia*], while it also attacked other conifers [cf. ibid., **18**, p. 358; **20**, p. 612; **21**, p. 174].

Field data were collected on the distribution of dying Scots pine [*Pinus sylvestris*] at Allerston Forest, Yorkshire. The symptoms closely resemble those of the die-back associated with *Fomes* [*annosus*] [ibid., **27**, p. 591; **28**, p. 654], but at Allerston the fungus does not commonly occur even in a secondary capacity. A preliminary survey in Allerston Forest of die-back of Corsican pine [*Pinus nigra* var. *calabrica*: ibid., **25**, p. 482] showed that it had no connexion with the dying of Scots pine in the same forest. The Scots pines die slowly, but generally, of root failure; with Corsican pine parts of the tree remain healthy while others die, and vigorous recovery shoots are often made just below affected portions; death may occur in severe cases. The disease seems to be most prevalent at higher elevations in areas of moderate or heavy rainfall. During the winter of 1948, a very serious outbreak occurred at Thornthwaite, apparently the worst so far recorded.

The first recorded instance of a disease of Sitka spruce was at Llantrisant Forest, South Wales, where groups of these trees and Corsican pine and Japanese larch [*Larix leptolepis*] were dying and a species of *Phytophthora* was isolated. In four other areas the disease seems to be confined to Sitka spruce. Studies are in progress, also, on a dying of Norway spruce [*Picea abies*] at Comlongon Estate, Dumfries, not apparently associated with a fungus pathogen.

A second annual assessment has shown that *Phaeocryptopus gaeumannii* is a damaging parasite on Douglas fir [ibid., **27**, p. 591]. A lime-sulphur preparation gave marked control of *Keithia* [*Didymascella*] *thujina* [loc. cit.] on *Thuja plicata* transplants.

The area at Farnham, Surrey, planted with poplar setts affected by [bacterial] canker [ibid., **29**, p. 129] was extended and trial varieties were interplanted. Among the clones received and collected are supposedly resistant strains of *P*[*opulus*] *eugenii* and *P. trichocarpa*.

The survey of 1,837 elm trees showed 22 per cent. to be infected [by *Ceratostomella ulmi*: ibid., **27**, p. 591], and it is evident the disease is increasing, if only temporarily. Clones which have retained their resistance since before the war are being propagated. Several reports were received of what appeared to be ink disease

of chestnut, caused by *Phytophthora* [*cinnamomi* and *P. cambivora*: cf. ibid., 18, p. 825; 29, p. 234], and a typical case was seen at Parkhurst Forest, Isle of Wight; there appeared to be a definite association between the disease and poor drainage.

Several cases of bark die-back in beech were noted, apparently associated to some extent with a species of *Nectria* [cf. ibid., 28, p. 258; 29, p. 483]. The provisions of the order concerning willow [*Salix*] watermark disease [*Bacterium salicis*: ibid., 20, p. 432] applicable to Essex [cf. ibid., 13, p. 334] were extended to Suffolk and to parts of Hertfordshire and Middlesex.

Dr. Ida Levisohn, dealing with soil mycology (pp. 76–77), states that growth stimulation resulted when *Robinia pseudo-acacia* was inoculated with specific nodule bacteria [? *Rhizobium* spp.].

Batko (S.). **A note on the distribution of Poria obliqua (Pers.) Bres.**—*Trans. Brit. mycol. Soc.*, 33, 1–2, pp. 105–106, 1 pl., 1950.

The author found specimens of *Poria obliqua* [*R.A.M.*, 26, pp. 366, 429; 28, p. 553, *et passim*], not recorded in Great Britain since 1938 [ibid., 19, p. 56], on birch (*Betula pubescens*) near Findogask, Perthshire, and along the River Dee, between Braemar and Inverey, in 1948. It was found again in February and April, 1949 on the same host at Hallburn, near Longtown, Cumberland, this being the first record from England.

Heim (R.) & Lami (R.). **La disparition des Peupliers de Paris sous les atteintes de l'Ungulina inzengae (de Not.) Pat.** [The disappearance of Poplars from Paris under the attacks of *Ungulina inzengae* (de Not.) Pat.]—*C.R. Acad. Agric. Fr.*, 36, 7, pp. 257–258, 1950.

About a year ago the authors' attention was directed to the diseased condition of the foliage of numerous poplars, some over a hundred years old, along the banks of the Seine in Paris, particularly those on the island of Saint-Louis. The effects of the disease were very serious, leading to partial or general desiccation of the tops; the presence of the characteristic brackets of *Ungulina fomentaria* var. *inzengae* [*Fomes fomentarius*: *R.A.M.*, 2, p. 198; 12, p. 343; 21, p. 475] and the general symptoms displayed indicated that this fungus was the cause of the disease. The condition is found chiefly in the middle of France and in the Île-de-France, where one of the authors has frequently observed rapid and disastrous extensions of the disease.

Pruning is no more than a palliative and if performed the wounds should be carefully tarred. Infection appears to follow the attacks of rodents which eat away the interior of the trunk. Control measures will, it is expected, be undertaken by the authorities concerned.

Pomerleau (R.). **Rapport général des travaux effectués sur la maladie hollandaise de l'Orme dans la Province de Québec en 1948.** [General report on the work done on Dutch Elm disease in the Province of Quebec in 1948.].—40 pp., 2 graphs, 8 maps, Québec, Service Forestier, Ministère des Terres et Forêts [? 1950. Mimeographed].

In this report [cf. *R.A.M.*, 29, p. 441] the author states that during the summer of 1948 a survey was made of 16,984 elms in an area of 16,000 square miles in the Province of Quebec, samples being taken from 4,553 trees. Laboratory tests of 3,647 samples (including 250 from Ottawa) showed *Ceratostomella ulmi* [loc. cit.] to be present in 2,580. Diseased trees were found in 36 counties; infection was reported for the first time in the counties Beauce, Sherbrooke, Compton, Laviolette, St-Jean, Beauharnois, and Soulanges, in all of which marked spread had occurred. The farthest extension was in Ontario, to Ottawa in the north and Prescott in the south. The disease was no longer present in Laprairie, Lévis, and Vaudreuil. In

1947 the area affected was estimated at 10,000 square miles, whereas in 1948 the figure was rather over 11,000, not counting the spread in Ontario. In spite of this the disease has not greatly extended its area since 1945.

Since 1944, when the disease was first discovered in Quebec, 6,882 affected trees have been cut down. Many affected trees may still be present in the forests of the central part of the infected area. So far at least 10,000 trees have succumbed to the disease in Quebec.

Feldman (A. W.), Caroselli (N. E.), & Howard (F. L.). **Physiology of toxin production by Ceratostomella ulmi.**—*Phytopathology*, 40, 4, pp. 341–354, 4 graphs, 1950.

Ceratostomella ulmi has been shown to produce in culture a toxic substance capable, on injection into elms, of inducing typical Dutch elm disease symptoms [*R.A.M.*, 26, p. 429]. Two toxic substances obtained from culture filtrates were identified as a polysaccharide and an alcohol-soluble component (abs. in *Phytopathology*, 37, p. 7, 1947). Each fraction caused symptoms typical of a part of the disease syndrome, i.e., the former an upward curling of the leaves with marginal withering and the latter interveinal necrosis. It has further been demonstrated that the toxin responsible for the wilting of test plants can be used for the assay of toxin-neutralizing chemicals [ibid., 32, pp. 22–23, 1942].

The object of the present study (a joint contribution from the Rhode Island Agricultural Experiment Station and the Bartlett Tree Research Laboratory, Stamford, Connecticut) was to find therapeutic chemicals that could be used to prevent or reduce the destructive action of the pathogen. The relationship of mycelial weight, age, pH, acid production, reducing substance utilization, and polysaccharide yield to the potency of the toxin was studied on liquid shake cultures of *C. ulmi* and measured by wilt indices of sand-grown tomato cuttings. Of these factors, only pH of the synthetic medium on which the fungus was grown was directly correlated with the wilt indices of the culture filtrates. In weakly buffered media the fungus caused a drop in the pH from 5·25 to 4 by the third or fourth day, after which it remained relatively constant. The toxin developed within 24 to 48 hours after a pH of 4 was reached. Fractionation of this culture filtrate yielded a polysaccharide and an alcohol-soluble fraction. Toxin with a high titre was rapidly produced in citrate-buffered media at pH 4·25. Production was less at pH 5·25, and at 7 the amount was very small. Buffering prevented the formation of the polysaccharide, but not of the toxic alcohol-soluble fraction. There was no relationship between the concentration of the polysaccharide (between 0·5 and 4 mg. per ml.) and its wilt index, and this substance is not believed to be the principal toxic component secreted by *C. ulmi*.

The toxin in the culture filtrate is irreversibly inactivated by hydroxyl ions, irrespective of the associated cations, at and above pH 6. Following up this ascertained effect of pH on toxin production and inactivation, greenhouse and field experiments during the last two years have shown that basic chemicals applied to the soil have not only retarded the destructive effects of the Dutch elm disease but enhanced the efficacy of both prophylactic and therapeutic chemicals.

Culture filtrates of the 'black' strain of *C. ulmi*, which produced the toxin most rapidly under optimum conditions, were used for assays to test the antidotal power of various chemicals. Fifteen were found to be effective.

Moreau (Mireille). **Note préliminaire sur une maladie chancreuse du Chêne rouge dans la sud-ouest de la France.** [Preliminary note on a canker disease of Red Oak in the south-west of France.]—*C.R. Acad. Agric. Fr.*, 36, 7, pp. 255–256, 1950.

From a piece of the trunk of a red oak (*Quercus rubra*) [*Q. borealis*] from Saint-

Pé-sur-Nivelle (Basses-Pyrénées), showing five parallel rows of deep cankers extending from the collar to a height of about 50 cm., the author isolated a species of *Phoma* provisionally regarded as *P. aposphaerioides* [*R.A.M.*, 21, p. 272]; in two isolations this fungus was associated with a species of *Cylindrocarpon*. After the material had remained about one month in the laboratory numerous red perithecia of a *Nectria* sp. developed, especially at the edges of the cankers. Isolations from this fungus gave rise to both the *Cylindrocarpon* and perfect states. Further investigations are in progress.

Beilmann (A. P.). **The Oak wilt.**—*Bull. Mo. bot. Gdn*, 38, 6, pp. 115–116, 1950.

In the United States the areas most affected by oak wilt (*Chalara quercina*) [*R.A.M.*, 29, p. 82] are in southern Minnesota and Wisconsin and north-eastern Iowa, but prevalence is increasing, and the disease has been present in St. Louis County, Missouri, for about seven years. The only measure that has checked local spread has been the prompt removal of all infected trees.

Chothia (H. P.). **Polystictus leoninus Klotzsch, a wound parasite.**—*Indian For.*, 76, 7, pp. 290–291, 1 pl., 1 fig., 1950.

A full description is given of *Polystictus leoninus*, which usually occurs as a saprophyte in India, but in recent years, since the severe frosts of 1945 and 1947, it has been found as a wound parasite of *Poinciana regia* (gold mohur), *Nerium odorum*, and *Cinnamomum camphora* in New Forest, Dehra Dun, and adjoining localities. It may also be present in standing trees of *Boswellia serrata* (salai, used for timber and paper pulp) containing heart rot, and in the bases of young trees where it enters as a wound parasite. It produces a white, spongy rot in which coloured zone lines develop.

Large (J. R.), Painter (J. H.), & Lewis (W. A.). **Thread blight in Tung orchards and its control.**—*Phytopathology*, 40, 5, pp. 453–459, 1950.

Tung (*Aleurites fordii* and *A. montana*) trees are infected by thread blight (*Corticium stevensii*) in ten commercial orchards in the southern United States [*R.A.M.*, 22, p. 459]. Severe infections are most prevalent in crowded orchards where high humidity and poor air circulation prevent the drying of the trees after long periods of rain, and interlacing of branches favours mycelial spread from tree to tree, the only mode of dissemination hitherto recognized. Control by means of pruning is effective only where the disease is limited to a few branches. In heavily infected orchards adjoining swamps containing diseased native plants [loc. cit.], at least one application of 6–6–100 or 6–2–100 Bordeaux mixture between late May and early July will be required every season, followed if necessary a month later by excision of the remaining points of infection.

MacDonald (J.). **Notes on the die back of European Larch.**—*J. For. Comm.*, *1949*, 20, pp. 192–198, 1949.

Die-back of European larch has attacked plantations all over Great Britain within the last few years and is associated with frost damage, canker [*Dasyscypha willkommii*: *R.A.M.*, 27, p. 456; 29, p. 392], and insect pests. It is most severe in the west of England and South Wales. It is clear in these regions that larch of Scottish origin is more resistant than that from the Alps or Silesia [cf. ibid., 28, p. 655].

The author discusses the history of the disease in Great Britain and deals with the effect of the origin of the seed and topography and soil. Advice is given on replanting plantations attacked by the disease. Larch may be planted again in some situations.